New Nouveau
Brunswick

Department of Transportation

Standard Specifications

January, 2006

NOTICE

USE OF NEW BRUNSWICK PROVINCIAL STANDARDS

The standards in the DOT Standard Specifications are intended to be used as pre-printed components of a construction Contract. They are not prepared as design aids or as a manual of design procedures and they will not competently serve those purposes.

It is the responsibility of the Bidder/Contractor to ensure they have an up-to-date copy of the Standard Construction Contract including the Articles of Agreement, Terms of Payment "A", General Conditions "B", and the Standard Specifications. The Standard Specifications are compliant with the Crown Construction Contracts Act.

Bid Items in the Standard Specifications are intended to be complete units of Work and clearly identify the scope, material requirements, and specific construction provisions to produce the specified end product.

The Standard Specifications rely on the use of specific words and phrases as defined in the Definitions (*Item 003)*.

The Standard Specifications form part of the Contract Documents and govern the performance of the Contractor even though an Item is not specifically noted as a bid Quantity. Items which are not noted as a bid Quantity are found under the following Divisions: Division 000 - Introduction; Division 800 - Provisional Sums; and Division 900 - Standard Conditions. It is imperative that users of these Standard Specifications understand this inter-relationship to the overall Contract and requisite behaviour of the Contractor within the context of the Contract.

JANUARY 2006

New Nouveau
Brunswick

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001.1 TERMINOLOGY

.1 This document is divided into specific Items.

  .1 Item is generally used with text that contains reference to payment and performance related to the Work.

  .2 Article is used to reference any subsection of an Item.

.2 Whenever in the Contract Documents and in documents resulting during the Work it is provided that anything is, done or to be done, if, as, when, or where "contemplated", "required", "directed", "requested", "deemed necessary", "permitted", "suitable", "approved", "acceptable", "unacceptable", "satisfactory", "unsatisfactory", "suspended", "sufficient", "authorized", "specified", "designated", and such similar expressions then the expression shall have the same force as if followed by the words "by the Engineer" or "to the Engineer" as the case may be.

.3 Unless otherwise specified in the text, all references to Specifications, Items, Tables or Figures shall refer to this document.

001.2 GENDER NOTATION

.1 Working titles having a masculine gender, such as workman, workmen and foreman and pronouns such as he, his and him are utilized in these Specifications for the sake of brevity, are intended to refer to persons of either sex and are gender neutral.

001.3 HEADINGS, TITLES and CAPTIONS

.1 The headings, titles and captions appearing in this document have been inserted as a matter of convenience and for the ease of reference only and in no way define, limit or enlarge the scope or meaning of the Standard Conditions, Specifications and/or the Particular Specifications.

001.4 PARTICULAR SPECIFICATIONS

.1 Particular Specifications are defined as Specifications adopted subsequent to the publication of this document and are particular and specific to a Contract.

.2 Particular Specifications shall prevail over those published herein whenever in conflict therewith.

001.5 CONFLICTS IN CODES AND STANDARDS

.1 Whenever a conflict in interpretation, application or direction occurs between this document and any other referenced document, including but not limited to related codes and/or standard practice, the most stringent requirement shall apply to the Work.

.2 In the event of a conflict the Engineer shall be the sole judge of the most stringent requirement, between the choices of action as noted to be in conflict between the documents.

002.1 ABBREVIATIONS

.1 Wherever the following abbreviations or terms are used in the Specifications, the Plans, or other Contract Documents, their intent and meaning shall be as follows:

Organizations

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APEGNB	Association of Professional Engineers and Geoscientists of New Brunswick
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BPR	Bureau of Public Works, Department of Commerce
CGSB	Canadian General Standards Board
CAN/CSA	Canadian Standards Association
CSA	Canadian Standards Association
CWB	Canadian Welding Bureau
ELG	Department of Environment & Local Government (New Brunswick)
DOT	Department of Transportation (New Brunswick)
DFO	Department of Fisheries and Oceans
MTO	Ministry of Transportation of Ontario
OPSS	Ontario Provincial Standard Specification
PCI	Prestressed Concrete Institute
PCA	Portland Cement Association
SSPC	Steel Structures Painting Council
TRB	Transportation Research Board
SI	International System of Units

Terms

AADT	Average Annual Daily Traffic
CHW	Creosote Hardwood
CAP	Corrugated Aluminum Alloy Pipe
CE	Common Excavation
CSP	Aluminum Coated Corrugated Steel Pipe
CSPA	Aluminum Corrugated Steel Pipe-Arch
DR	Dimension Ratio for plastic pipe
EOS	Equivalent Opening Size
EPP	Environmental Protection Plan
ESAL	Equivalent Single Axle Load
GC	General Conditions "B" of the Contract
LOC	Limit of Contract
PCP	Pre-cast Concrete Pipe
PE	Polethylene
PVC	Polyvinyl Chloride
RAP	Reclaimed Asphalt Pavement
RCP	Reinforced Concrete Pipe
ROW	Right of Way
SPCAP	Structural Plate Corrugated Aluminium Alloy Pipe

Terms

SPCSP	Structural Plate Aluminum Coated Corrugated Steel Pipe
SPCAPA	Structural Plate Corrugated Aluminium Alloy Pipe-Arch
SPCSPA	Structural Plate Aluminum Coated Corrugated Steel Pipe-Arch
SRE	Solid Rock Excavation
UNE	Unclassified Excavation
WATCM	Work Area Traffic Control Manual (DOT)

002.2 PUBLICATIONS AND REGULATIONS

.1 When publications or regulations are referred to, the reference is to the latest version available at the time of the signing of the Contract.

002.3 SI TERMS

.1 The following table of common metric terms and abbreviations shall apply to all Work carried out under the terms of the Standard Specifications.

.2 Other terms and abbreviations may be used if they are referenced in the context in which they are used.

.3 Where no units are indicated on the Plans for the measurement of length or distance, the unit of measure shall be millimetres unless otherwise noted.

Physical Quantity	Common SI units	SI Symbol
Area	square millimetre	mm^2
	square metre	m^2
	hectare	ha
	square kilometre	km^2
Density	gram per cubic metre	g/m^3 (mg/L)
	kilogram per cubic metre	kg/m^3
	tonne per cubic metre	t/m^3
Energy	joule (Newton metre)	J
	kilojoule	kJ
	megajoule	MJ
Force	Newton	N
	kilonewton	kN
	meganewton	MN

Physical Quantity	Common SI units	SI Symbol
Length	micron	μm
	millimetre	mm
	metre	m
	kilometre	km
Light	lux	lx
	kilolux	klx
Mass	milligram	mg
	gram	g
	kilogram	kg
	tonne	t
Permeability	metre per second	m/s
	metre per year	m/a
Power	watt	W
	kilowatt	kW
Pressure	pascal	Pa
	kilopascal	kPa
	megapascal	MPa
Stress	newton per square metre	N/m^2
	kilonewton per square metre	kN/m^2
	meganewton per square metre	MN/m^2
Temperature	degree celsius	°C
Time	second	s
	minute	min
	hour	h
	day	d
	year	a
Torque	newton metre	N•m

Physical Quantity	Common SI units	SI Symbol
Unit Weight	kilonewton per cubic metre	kN/m^3
Velocity	metre per second	m/s
	kilometre per hour	km/h
Viscosity Dynamic	pascal second	Pa•s
	millipascal second	mPa•s
Viscosity Kinematic	square millimetre per second	mm^2/s
	square metre per second	m^2/s
Volume solid	cubic millimetre	mm^3
	cubic decimetre	dm^3
	cubic metre	m^3
Volume fluid	millilitre	mL
	litre	L
	kilolitre	kL
	cubic metre	m^3
Volume Rate of Flow	cubic metre per second	m^3/s
	litre per minute	L/min

DEFINITIONS

003.1 DESCRIPTION

.1 The following words and phrases, wherever used in the Contract Documents, shall have the meaning ascribed to them set out below in order to provide consistency and clarity of intent.

.2 Where it is intended that words and phrases used in the Contract Documents are to have meanings ascribed in this definitions item such words and phrases shall be designated by the use of a capital letter for the first letter of each word or each word of a phrase.

.3 Where words and phrases are not defined in this item then reliance should be placed on a standard dictionary definition, Compilation of ASTM Standard Definitions and/or ASTM D653, and having regard to the context in which such words or phrases are used.

003.2 DEFINITIONS

Actual Basic Rate - rate per hour paid to the Contractor's employee exclusive of any allowances or mark-ups for the Contractor's overhead, profit or other administrative costs related to the employee and not directly accrued to that employee.

Addendum - see Tender Addendum

Aggregate Base - the layer of crushed aggregate placed as a distinct layer directly below the Pavement.

Aggregate Subbase - the layer of aggregate placed as a distinct layer between the Aggregate Base and the Subgrade.

Backslope - Slope between the back-of-ditch and original ground.

Bidder - a person, partnership or corporation, acting directly or through a duly authorized representative, submitting a tender for the Work.

Borrow - an excavated material used in construction; the source of which is located outside the Right-of-Way.

Bridge - any Structure in excess of 3 m in span length carrying vehicular and/or pedestrian traffic.

Bridge Length - the greater dimension of a Structure measured along the centre of the deck between backs of abutment walls or between ends of Bridge deck.

Bridge Width - the clear width of a Structure measured at right angles to the centre of the deck between the bottom of curbs or, if curbs are not used, between the inner faces of parapet or railing.

Change Order - a written order issued by the Engineer to the Contractor, covering changes in the Contract Documents or Quantities or both, within the scope of the Contract and establishing the basis of payment and time adjustments for the Work affected by the change.

Completion Date - the date specified in the Contract Documents on which the Contract is to be completed.

Conform - compliance with reasonable and customary manufacturing and construction tolerances where working tolerances are not specified. Where working tolerances are specified, Conform means compliance with such tolerances.

Contract - as per the Articles of Agreement of the Standard Construction Contract.

Contractor - the party of the first part to the Contract acting directly or indirectly through agents or employees, who is primarily liable for the acceptable performance of the Contract and also for the payment of all legal debts pertaining to the Work.

Contract Documents - the executed Articles of Agreement, the Tender, Terms of Payment "A", General Conditions "B", Standard Specifications, Particular Specifications, Plans and any Addenda incorporated into the Contract before the execution of the Articles of Agreement, and such other documents as may be listed in the Articles of Agreement and subsequent amendments to the Contract made pursuant to the provisions of the Articles of Agreement.

Culvert - any Structure, not classified as a Bridge, and/or drainage system which provides an opening for the passage of water under any Roadway or driveway.

Day - a calendar day and shall include all days without exception.

Dust - the fine particles of a mass defined by the percentage passing the 75 micron size sieve as tested by standard sieve analysis methods on a sampled prepared and tested on the fraction of the whole sample passing the 100 mm sieve size.

Engineer - the Chief Engineer of the Department of Transportation of the Province of New Brunswick otherwise named as the Engineer-Architect as per General Conditions "B" section 1(1) of the Contract.

This shall include any person authorized by him to perform on his behalf any function under the Contract and shall include without being limited to any persons acting either directly or through authorized assistants, such as Engineers, Technicians, Inspectors, by whom all explanations and directions necessary for the satisfactory prosecution and completion of the Work will be given.

Equipment - all machinery, and vehicles, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the Work.

Finished Grade - the grade to indicate the finished Pavement elevation of the centre line.

Foreslope - the Slope between the Shoulder and the ditch, or between the Shoulder and the original ground in case of a fill.

Highway - the whole strip of land reserved for and secured for the use of the travelling public, being bounded by the Right of Way lines, as at present, or as said lines may be changed to include extra land which the Owner may from time to time acquire during the progress of the Contract.

Initial Work Schedule - the Work schedule submitted prior to the award of the Contract.

Laboratory - any official testing facility maintained by the Owner or any other testing facility designated by the Owner.

Lane - the portion of a travelled way for the movement of a single line of vehicles.

Lump Sum Price - a Contract item for which payment will be made at a single tendered price, all inclusive for the completion of the Work defined. Payment is not based on a measured Quantity, although a Quantity may be given in the Contract Documents.

Overbreak - the portion of any rock which is excavated, displaced, or loosened outside and beyond the established payment lines regardless of whether the excess is due to the inherent character of any rock formation encountered, or to any other cause.

Overburden - any material that must be removed to access underlying suitable construction materials, exclusive of the grubbed material.

Overexcavation - all excavation beyond that specified, performed without the written order of the Engineer.

Owner - shall be as stated in the General Conditions "B" section 1(1).

Pavement - surface and/or base mixes whether Portland cement, asphalt concrete and/or chip seal.

Pavement Structure - all material placed above the Subgrade which would include Aggregate Subbase, Aggregate Base and Pavement providing support for, and the distribution of the traffic load to the Subgrade.

Plans - shall include all graphical representations including but not limited to Profiles, cross-sections and other drawings, or exact reproductions thereof, which show the location, character, dimensions and details of the Work.

Profile - a charted line indicating grades and distances and usually depth of cut and height of fill for excavation and grading Work; taken along a centreline or other designated line. A side view, as distinct from a plan or overhead view.

Progress Estimate - shall have the same meaning as "progress claim" as attributed to it by usage in the Terms of Payment "A" and the General Conditions "B".

Quantity- the amount presented on the Tender Form is to be considered as approximate only, and is to be used as an estimate of the Work. Final payment to the Contractor will be made only for the actual aggregate of Work performed or material furnished in accordance with the Contract Documents as determined by measurements made by the Engineer.

Right-of-Way - the land secured and reserved to the public for Highway purposes.

Roadbed - that portion of the Roadway between the inside edges of Slopes of ditches and fills (referenced from centreline).

Roadway - that portion of the Right-of-Way required for construction, limited by the outside edges of the Slopes (referenced from centreline), and including ditches, channels and all Structures appertaining to the Work.

Shoulder - that portion of the Roadway from the outside edges of the Lane or Lanes to the inside edge (referenced from centreline) of the Slopes of ditches and fills.

Sidewalk - that portion of the Roadway constructed for the use of pedestrians.

Skew or Skew Angle - the acute angle formed by the intersection of a line normal to the centre line of the Roadway with a line parallel to the face of the abutments, the centre line of the piers, or in the case of Culverts with the centre line of the barrel.

Slope - run to rise expressed as a ratio.

Soil Particle Sizes - the following soil particles sizes shall apply for the terms used to describe the material;

boulder	average dimension greater than 300 mm.
cobble	average dimension between 75 and 300 mm.
gravel	particle passing a 75 mm sieve and retained on a 4.75 mm sieve.
sand	particle passing a 4.75 mm sieve and retained on a 75 μm sieve.
silt	particle passing a 75 μm sieve and is non-plastic to slightly plastic and exhibits no strength when air dried.
clay	fine grained soil or the fine grained portion of a soil that can be made to exhibit plasticity within a range of water contents and exhibits considerable strength when air dry. Also defined as particle finer than 2 μm.

Specifications - the statements, provisions and requirements contained in the Contract Documents, that define the products, materials and workmanship upon which the Contract for the Work is based.

Stripping - either the removal of topsoil and/or Overburden or the action of water resulting in the removal of the asphalt cement from the aggregate.

Structure(s) - Bridges, Culverts, catch basins, drop inlets, manholes, retaining walls, overhead sign structures, concrete barriers, cribbing, walls, buildings, sewers, service pipes, sub-drains, foundation drains and other features which may be encountered in the Work and not otherwise classed herein.

Subgrade - the layer, whether in cut or fill, as prepared to support the Pavement Structure; or the surface which forms the finished elevation of this layer, defined at the centreline.

Substantial Completion - The condition of the Work when the Work Site is ready for the Owner's acceptance and occupancy, except for the performance of any cleanup and/or finishing, and the remediation of other deficiencies as defined by the Engineer.

Substructure - all that part of the Structure below the bearings of simple and continuous spans, skewback of arches and tops of footings of rigid frames; including but not limited to ; backwalls, wingwalls and wing protection railings, and for the expressed purposes of winter concreteing - cast in place box culverts and cast in place concrete arches.

Superintendent - the Contractor's authorized representative of record in responsible charge of the Work.

Superstructure - all that part of the Structure supported on piers or abutments located above the bearings of simple and continuous spans, and the deck slab of rigid frames.

Tender Addendum - a change in a tender issued prior to the time and date of tender closing, which has the effect of modifying the tender. A Tender Addendum shall be considered as an integral component of the tender and shall be deemed to take precedence over those parts of the tender documents to which the Addendum refers.

Ticket - see Weight Certificate.

Unit Price - the amount stated in the Contract representing the price per unit for all labour, tools, Equipment, materials, transportation costs and expenses, and any and all other incidentals necessary to complete the Work and does not include the HST.

Utility - a facility maintained by a municipality, public authority or regulated authority and includes, but is not limited to sanitary sewer, storm sewer, water, electric, gas, steam, telephone and cable television services.

Weight Certificate - a voucher, issued by the Owner at the point of origin of a load to a truck driver and delivered to and verified by the Owner's representative at the Work Site. This voucher shall describe the Quantity of material upon which payment of the load is to be based and shall show information pertinent and necessary for the evaluation of the load by the Engineer and others.

Work - includes all labour, material and services required, as shown or described in the Contract, supplied and installed or erected complete at the place of building.

Work Area - the location in the Work Site on which Work is being carried out.

Work Site - the lands and premises owned by the Owner or in which the Owner has proprietary interest, upon which the Work is to be performed and as defined in the Contract Documents.

005.1 ORDERS OF THE ENGINEER

.1 The Contractor shall promptly and efficiently comply with all orders, directions and instructions given at any time by the Engineer with respect to the Work or the conduct thereof.

.2 If the Contractor disagrees with any order, direction or instruction given at any time by the Engineer, he shall perform the Work as instructed and shall serve notice in accordance with terms set out in the General Conditions.

005.2 CONSTRUCTION METHODS AND EQUIPMENT

.1 Equipment and methods used shall be appropriate to perform the Work outlined in the Contract Documents.

.2 The Engineer reserves the right to order the discontinuance or use of any Equipment or method which fails to consistently produce satisfactory results.

005.3 UNAUTHORIZED WORK

.1 Any Work done or material supplied by the Contractor which is beyond the lines, grades, or descriptions detailed in the Contract Documents, or established by the Owner by written notification, shall be considered as unauthorized and may not be measured for payment.

.2 Upon order of the Engineer, unauthorized Work or material shall be remedied, removed or replaced by the Contractor, at his own expense.

    .1 If the Contractor fails to comply promptly with any order made under this Section, the Engineer may cause unauthorized Work or material to be remedied, removed or replaced in accordance with the terms of the General Conditions.

006.1 DESCRIPTION

.1 The Contractor shall review all permits in force for the Work and the conditions as set out in Item 948 and the Contract Documents.

.2 All other permits required, but not forming part of the Contract Documents but necessary and requisite for the carrying out of the Work shall be obtained by the Contractor, at his own expense, unless otherwise specified.

DIVISION 100

ITEM	DESCRIPTION	NUMBER OF PAGES
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106	Common Excavation	5
107	Unclassified Excavation	2
108	Solid Rock Excavation	5
116	Ditching	2
121	Borrow	3
130	Metal Pipe	4
131	Metal Pipe - Large	2
136	Subdrain	2
137	Subdrain Outlet	2
140	Concrete Pipe	4
141	Concrete Pipe - Large	3
142	Precast Concrete Box Culvert	7
161	Foundation Excavation	3
166	Backfilling Around Structures	2
167	Backfill For Structures	2

ITEM	DESCRIPTION	NUMBER OF PAGES
169	Induced Trench	2
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186	Removal of Fence	1
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106 - 1 Shaping of Overburden at Top of Solid Rock Backslope
108 - 1 Solid Rock Transitions (longitudinal)
136 - 1 Subdrain
137 - 1 Subdrain Outlet
140 - 1 Tension Rod/Bar Assembly
161 - 1 Case 1.1 - Cross Culvert : Subgrade above Original Ground - Trench ≤ 1.2 m
161 - 2 Case 1.2 - Cross Culvert : Subgrade above Original Ground - Trench > 1.2 m
161 - 3 Case 2.1 - Cross Culvert : Original Ground above Subgrade - Trench ≤ 2.2 m
161 - 4 Case 2.2 - Cross Culvert : Original Ground above Subgrade - Trench > 2.2 m
161 - 5 Case 3.1 - Storm Drainage Culvert Longitudinal to the Centreline of Roadway
161 - 6 Foundation Excavation for Footings - Solid Rock and Common Cases
161 - 7 Foundation Excavation for Footings - Common over Solid Rock Case
182 - 1 Chain Link Fence
182 - 2 Chain Link Gate

101.1 DESCRIPTION

.1 This Item consists of cutting and salvaging Merchantable Timber, and disposing of all other trees, brush and slash.

.2 Merchantable Timber is any tree which contains at least one merchantable bolt.

  .1 A merchantable bolt is any primary forest product 2.44 m in length at an 80 mm diameter top (outside bark).

101.2 MATERIALS

.1 None identified.

101.3 SUBMITTALS

.1 The Contractor shall submit, upon request, a copy of any permit(s) required to carry out the Work.

101.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All Merchantable Timber shall be salvaged, such that no big tops (containing a merchantable bolt) are left.

  .1 Salvaged material shall become the property of the Contractor and shall be removed from the Work Site before the Completion Date of the Contract.

  .2 Loads of wood transported from clearing operations within the Contract ROW shall require a Transportation Certificate (TC) titled "Crown Land Harvest Permit".

  .3 For the purposes of filling out the TC, "Other" (in the top right of the form) shall be "DOT ROW", and "Harvest Block No." shall be the Contract number.

.3 Before commencing clearing on any part of the Work Site that had been Crown Land under licence, the Contractor shall offer to sell to the former licensee all Merchantable Timber involved.

  .1 The price shall be the current price negotiated between the former licensee and the Forest Products Marketing Board responsible for the area in which the timber is harvested.

  .2 If the former licensee decides to purchase the cut timber, the Contractor shall perform the Work to the former licensee's specifications.

101.4 .4 All merchantable trees, and all nonmerchantable trees except as noted in 101.4.6.2, shall be cut so that stump height is not greater than 0.5 m above average ground level.

.1 Nonmerchantable trees, instead of being cut and felled, may be shredded in place using equipment designed for that purpose, but shall not be bulldozed down.

.2 The Contractor shall avoid long skids of timber on steep slopes adjacent to watercourses, and felling or skidding trees across a watercourse.

.3 The Contractor shall limit use of Heavy Equipment for clearing within 10 m of stream banks and, to the extent possible, shall do cutting therein by hand or by Equipment able to "reach in" to cut and yard out the timber.

.4 The Contractor shall minimize ground disturbance to minimize the potential for erosion and sedimentation of watercourses and wetlands.

.5 Directional hand felling and harvesting shall be used where ground conditions are not suitable for access by heavy Equipment. When cable skidders are used, every effort shall be made to avoid rutting soft ground areas by utilizing the full range of the cables.

.5 When the Contract does not include Item 102, as on a clearing contract, all nonmerchantable trees, brush and slash shall be disposed of within the Work Site by chipping or shredding and spreading out the chipped/shredded material.

.6 When the Contract includes Item 102, all nonmerchantable trees, brush and slash shall be disposed of by chipping or shredding within the Work Site, or as follows:

.1 In areas of excavation, or where fills are less than 2.5 m in height to Subgrade, disposal may be carried out in conjunction with the grubbing operation.

.2 Where fills are over 5 m in height to Subgrade, nonmerchantable trees may be left in place along with brush and slash within the limits of the fill, subject to 101.4.6.5.2.

.3 The Engineer may authorize nonmerchantable trees, brush and slash from other Work Areas to be placed under fills over 5 m in height to Subgrade, or at locations within the Work Site as indicated in the Contract Documents, if they are spread out and tramped flat in a uniform layer to a compact mass no more than 0.6 m above original ground, using a crawler tractor of 20 t or heavier.

.4 Notwithstanding 101.4.6.2 to 106.4.6.3, all nonmerchantable trees, brush and slash shall be disposed of such that the Engineer can set and grade centreline stakes; set toe-of-slope stakes in areas of fills over 5 m in height to Subgrade; and do cross-sections in areas as described in 102.4.4.

101.4.6 .5 Nonmerchantable trees, brush or slash shall not be left or placed as follows:

.1 Between the clearing line and the limits of grubbing described in 102.4.3;

.2 Between the clearing line and the toes-of-Slope, or such that it protrudes from the Foreslopes, of fills greater than 5 m in height to Subgrade; or

.3 Outside the clearing line (except in approved disposal areas).

.7 Ornamental trees and shrubs shall not be disturbed without written permission from the Engineer.

101.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of hectares of land cleared in accordance with this Item.

.1 All measurements shall be made in a horizontal plane.

101.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

102.1 DESCRIPTION

.1 This Item consists of the removal and disposal of roots and stumps.

102.2 MATERIALS

.1 None identified.

102.3 SUBMITTALS

.1 The Contractor shall submit, upon request, a copy of any permit(s) required to carry out the Work.

102.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work in accordance with Item 946 and Item 948.

.3 Grubbing shall be carried out with root rakes or similar Equipment, such that only the roots and stumps are removed and topsoil is left for salvage under the excavation item.

  .1 In cut sections, and in fill sections where the Subgrade is within 2.5 m of the original ground, grubbing shall be carried out to a width 2 m from the clearing line or as otherwise directed by the Engineer.

.4 Grubbing shall not be carried out in fill sections where the Subgrade is more than 2.5 m above the original ground, except as approved by the Engineer where foundation excavation or stream diversions for Structures are to be carried out.

  .1 Grubbing shall not be carried out in swamps and other areas where the underlying material is to be wasted, as indicated in the Contract Documents or by the Engineer.

.5 The Contractor shall be responsible, at his own expense, to carry out any remedial measures necessary to redress any areas grubbed beyond the specified limits, including but not limited to extra shaping, hydroseeding and/or mulching of the exposed ground, and removal of trees which have fallen as a result of root severance due to the over-width grubbing.

102.4 .6 Roots and stumps, with or without nonmerchantable trees, brush and slash as per 101.4.6, shall be disposed of within the Work Site by tub-grinding, or by burial as follows:

- .1 The materials may be placed under fills over 5 m in height to Subgrade, if the materials are spread out and tramped flat in a uniform layer to a compact mass no more than 0.6 m above original ground, using a crawler tractor of 20 t or heavier.

- .2 Where Roadbed fills exceed 6 m in height to Subgrade, the Contractor may place one layer of grubbed materials either on the existing ground, or on the first lift of compacted excavated material or Borrow, and shall tramp the materials to a 0.6 m thickness as described in 102.4.6.1.

- .3 Burying may be permitted at other locations within the Work Site as indicated in the Contract Documents and/or as approved by the Engineer, if the materials are spread out, tramped, and covered with excavated material as directed by the Engineer, and the surface hydroseeded in accordance with 614.4.

.7 Where the disposal measures of 102.4.6 are determined by the Engineer to be unfeasible, the roots and stumps, with or without nonmerchantable timber, brush and slash as per 101.4.6, may be disposed of outside the Work Site in accordance with Item 947.

.8 No materials removed during grubbing shall be permitted to be placed within 30 m of a Culvert, Bridge or any other Structure.

102.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of hectares of grubbing carried out in accordance with this Item.

- .1 All measurements shall be made in a horizontal plane.

102.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

103.1 DESCRIPTION

.1 This Item consists of the removal and disposal of isolated trees complete with stumps, and/or isolated stumps.

  .1 An isolated tree is defined as a tree having a minimum diameter of 100 mm measured at 300 mm above the existing ground surface.

  .2 An isolated stump is defined as a stump having a minimum top diameter of 300 mm.

103.2 MATERIALS

.1 None identified.

103.3 SUBMITTALS

.1 None identified.

103.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Isolated trees and stumps shall be clearly identified as such in the field, by the Engineer.

.3 Ornamental trees and shrubs shall not be disturbed without written permission from the Engineer.

.4 The Contractor shall be responsible to repair, at his own expense, any damage to private property resulting from the Work.

.5 The Contractor shall carry out the removal in accordance with 101.4 and 102.4.

103.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of isolated trees and/or isolated stumps removed and disposed of in accordance with this Item.

103.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

106.1 DESCRIPTION

.1 This Item consists of the excavation and placement within the Work Site or disposal outside the Work Site, of soil and all other materials not classified as solid rock.

106.2 MATERIALS

.1 For temporary stream diversion channels, clear polyethylene liners a minimum of 6 mils thick and meeting the requirements of CGSB 51.34 shall be supplied by the Contractor.

106.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

106.4 CONSTRUCTION

106.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work in conjunction with Item 946 and Item 948.

.3 The Contractor shall construct offtakes and stream diversion channels as identified and/or detailed in the Contract Documents.

.4 Polyethylene liners for temporary stream diversions shall be installed transverse to the direction of flow and overlaps shall be a minimum of 300 mm in the direction of flow.

  .1 The Contractor shall be responsible for maintenance and removal of the liners.

.5 The Contractor shall maintain surface drainage during excavation of cuts and construction of embankments.

  .1 Low spots and ruts that could pond water shall be removed no later than the end of each Day's Work or, if rain is imminent, as Work progresses during the Day.

.6 If at any time during the Work the surface becomes rutted or displaced, the Contractor shall make all necessary repairs to reinstate the surface grade.

  .1 The depth rutted and/or displaced shall be scarified, moisture conditioned, shaped and compacted to meet the requirements of this Item.

.7 Where the Roadbed being constructed is subject to through-traffic, the Contractor shall conduct his operations so that through-traffic does not travel directly on an undercut surface or Subgrade, unless approved by the Engineer.

106.4.1.7 .1 Any surface constructed or exposed by the Contractor and subjected to through-traffic shall be maintained in a condition such that traffic can safely travel along it at the speed limit posted for the Work Area.

.8 Transitions in cut and fill conditions, at the ends of bedrock cuts, shall be carried out as indicated on Standard Drawing 108-1.

106.4 .2 Excavation

.1 The Contractor shall not commence any excavation until the original cross-section survey has been completed for the Work Area involved.

.2 The Contractor shall control the excavation and handling of the common material such that optimum usage of the excavated materials is achieved, as follows:

.1 Any material suitable for topsoil, from cuts, and from fill areas that will be stripped, shall be salvaged and stockpiled at the location(s) approved by the Engineer.

.1 The depth of excavation of the topsoil layer shall be as determined in the field at the time of excavation, between the Contractor and the Engineer.

.2 Stockpile(s) shall not be located where they will inhibit orderly construction and completion of ditches and slopes as per Item 946, block or inhibit natural drainage, or be a potential source of siltation to watercourses.

.3 Stockpiling shall be carried out such that the maximum recovery of the material is assured.

.4 Topsoil stockpiles shall be mulched in accordance with Item 616.

.2 The Contractor shall separately excavate or otherwise salvage materials meeting the requirements of 121.2 - Borrow A, for use in the top 600 mm of the Subgrade.

.3 Where the Contract includes Borrow, the Contractor shall conduct his operations such that all usable material resulting from common excavation either has been used or will be used in the Work, prior to the placement of any material under Item 121.

.1 Borrow shall not be placed in areas where excavated materials could be hauled and placed at a lesser cost to the Owner, unless otherwise authorized by the Engineer.

.3 Where the Subgrade requires undercutting, subexcavation shall be carried out to the specified depth below Subgrade on a plane parallel to the Subgrade cross-slope.

.4 All overhaul shall be subject to the approval of the Engineer.

.1 Excavated material shall be placed in the nearest embankment(s) so as to minimize the overhaul Quantities, unless otherwise directed by the Engineer.

106.4.2 .5 Hauling of common excavation over Aggregate Base/Subbase will not be permitted, unless authorized by the Engineer.

.6 The Contractor shall shape ditches to the lines and grades specified, and any grade conditions that would cause water to pond shall be removed.

.7 In cuts, the area between the top of the Backslope and the edge of the ungrubbed surface shall be shaped to eliminate vertical or overhanging faces, exposed roots and any material which would impede natural drainage.

.8 Where common material is underlain by a deep bedrock cut, the material at the top of the bedrock Backslopes shall be shaped as indicated on Standard Drawing 106-1.

.9 Excavated material designated by the Engineer as surplus and useable, shall remain the property of the Owner and shall be either stockpiled or otherwise placed in the Work, as directed by the Engineer.

.10 Excavated material designated by the Engineer as waste, shall become the property of the Contractor and shall be disposed of in accordance with Item 947.

.11 Boulders 1 m^3 or larger that are encountered in the Work shall be handled in accordance with Item 108.

106.4 .3 Placement

.1 The placement of excavated material shall be carried out in accordance with Item 941, to conform to lines and grades provided.

.2 The placement of material shall be in layers, and each layer shall be shaped to maintain surface drainage.

.3 Embankments shall be constructed such that the first lift when shaped forms the toe of the Foreslopes and each successive lift shall be completed to the full width prior to placing the next lift.

  .1 On ungrubbed areas, swamps and rough terrain the initial lift thickness shall be as approved by the Engineer.

.4 Material placed to within 600 mm below Subgrade shall have a maximum lift thickness of 300 mm.

  .1 The lift thickness may be increased to a maximum of 600 mm if the Contractor can provide proof that the specified density can be achieved throughout the entire lift.

.5 Material placed in the top 600 mm of the Subgrade shall meet the requirements of 121.2 - Borrow A and shall be placed as specified in 106.4.3.4.

  .1 In backfilling of undercuts deeper than 600 mm, the lift thicknesses shall be as determined by the Engineer.

106.4.3 .6 Where embankments are constructed against an existing earth sidehill having a Slope steeper than 3:1, for the top 2.5 m below Subgrade the spreading Equipment shall cut into the sidehill as each lift of fill is placed so that the next lift is"keyed" into the sidehill to a width not less than 1 m.

.7 Where the Work involves placement of material firstly along one side of the Roadbed and then the other side, the spreading Equipment shall cut into the edge of the previously built side of the Roadbed as each lift of material is placed, so that the next lift is "keyed" into the adjacent side of the Roadbed or the existing Roadway Slope to a width not less than 0.5 m.

.8 Excavated material placed behind Structures or in areas where Structures are to be constructed shall be a material meeting the requirements of 121.2 - Borrow A, and shall have lift thicknesses as follows:

  .1 Maximum 200 mm behind abutment breastwalls or other earth-retaining Structures, to the limits shown on the Plans; or

  .2 Maximum 300 mm where Structures will be constructed or through which piles will be driven.

106.4 .4 Compaction

.1 The Contractor shall carry out moisture conditioning and compaction in accordance with Item 936.

  .1 Any isolated soft spots or other areas within the top 1.2 m of the Subgrade not meeting the specified compaction criteria shall be excavated and backfilled with material of the quality matching the surrounding material, as directed by the Engineer.

.2 In cuts, the Subgrade surface shall be compacted to the control density as determined by a test strip.

  .1 If the Subgrade has been undercut, the undercut surface shall be rolled with a static roller prior to being backfilled with Borrow A-quality material to Subgrade.

.3 Each lift of excavated material, after placement as per 106.4.3, shall be compacted to a minimum of 95% of the maximum dry density.

106.4 .5 Culverts

.1 Where excavation involves removal of Culverts, the Contractor shall take care to ensure that any existing pipe is not damaged and is salvaged for re-use.

  .1 The Contractor shall notify the Engineer prior to exposing any existing pipe.

106.4.5.1 .2 Pipe determined by the Engineer to be salvageable shall remain the property of the Owner and shall be re-used in the Work Site under Item 140, or transported to the nearest DOT Maintenance Depot.

.1 Salvagable pipe that is damaged as a result of the Contractor's actions, as determined by the Engineer, shall be replaced by the Contractor.

.3 Unsalvageable pipe and waste shall become the property of the Contractor and shall be disposed of outside the Work Site.

106.4 .6 Driveways

.1 Driveways excavated under this Item shall be replaced the same Day they are removed, utilizing material excavated from the crossing wherever possible.

.2 Where excavation involves paved driveways, parking lots or other abutting private lands the Pavement shall be cut to a neat straight line and edge, and removed in a manner so as to avoid damage to the adjacent lands and Roadbed.

.1 The Contractor shall be responsible for damage to the Pavement and other surfaces beyond the designated limits of the excavation and for the repair or restoration, at his own expense, of the areas affected.

.2 The excavated Pavement shall be broken down into pieces small enough to be suitable for use in embankment construction, unless designated by the Engineer as waste to be disposed of outside the Work Site.

106.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of cubic metres of common material excavated and placed, stockpiled and/or disposed of in accordance with this Item.

.2 The volume shall be as measured in situ and computed by the average end area method, based on "original ground" sections surveyed by the Engineer after grubbing.

.1 Where grubbing is not carried out, as in swamps or other areas where excavated material will be wasted, the "original ground" cross-sections will be taken on the natural surface or if cleared, on the ungrubbed surface after completion of clearing.

.3 Excavation of soft spots, deleterious materials, offtakes, stream diversion channels and driveways as defined by this Item shall be measured for payment.

106.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of common excavation, as identified under the Contract.

.2 The overhaul of material placed in Roadway Work, stockpile(s) or as backfill for Structures, as approved by the Engineer, will be paid for in accordance with Item 806.

.3 Except as indicated in 106.6.2 overhaul will not be paid for material removed under this Item and used under other Items.

107.1 DESCRIPTION

.1 This Item consists of the excavation and placement within the Work Site or disposal outside the Work Site, of materials classified under neither common excavation nor solid rock excavation but composed of a mixture and variable and undetermined distribution of both.

107.2 MATERIALS

.1 For temporary stream diversion channels, clear polyethylene liners a minimum of 6 mils thick and meeting the requirements of CGSB 51.34 shall be supplied by the Contractor.

107.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

107.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work in conjunction with Item 946 and Item 948.

.3 The Contractor shall construct offtakes and stream diversion channels as identified and/or detailed in the Contract Documents.

.4 Polyethylene liners for temporary stream diversions shall be installed transverse to the direction of flow and overlaps shall be a minimum of 300 mm in the direction of flow.

  .1 The Contractor shall be responsible for maintenance and removal of the liners.

.5 The Contractor shall handle material which would otherwise be classified under common excavation in accordance with 106.4.

.6 The Contractor shall handle material which would otherwise be classified under solid rock excavation in accordance with 108.4.

107.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of cubic metres of unclassified material excavated and either placed, stockpiled or disposed of in accordance with this Item.

107.5 .2 The volume shall be as measured in situ and computed by the average end area method, based on "original ground" sections surveyed by the Owner after grubbing.

.1 Where grubbing is not carried out, as in swamps or other areas where excavated material will be wasted, the "original ground" cross-sections will be taken on the natural surface or if cleared, on the ungrubbed surface after completion of clearing.

.3 Excavation of offtakes and stream diversion channels as per 106.4.1.3, soft spots and deleterious materials as per 106.4.3.1.1, and the excavation of driveways as per 106.4.5, shall be measured for payment.

107.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of unclassified excavation, as identified under the Contract.

.2 The overhaul of material placed in Roadway Work, stockpile(s) or as backfill for Structures, as approved by the Engineer, will be paid for in accordance with Item 807.

.3 Except as indicated in 107.6.2 overhaul will not be paid for material removed under this Item and used under other Items.

108.1 DESCRIPTION

.1 This Item consists of the excavation and placement within the Work Site, or disposal outside the Work Site, of solid rock.

.2 Solid rock is defined as in situ bedrock, and naturally occurring boulders that are 1 m^3 or larger in volume.

108.2 MATERIALS

.1 None identified.

108.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

.2 The Contractor shall submit to the Engineer, in advance of any drilling and blasting, the following information:

  .1 Copy of Insurance Policy as it relates to blasting, and any pre-blast survey requirements therein.

  .2 Copy of the blaster's certification per Regulation 97-125 under the Apprenticeship and Occupational Certification Act.

.3 The Contractor shall submit upon request the following information:

  .1 A letter signed by the certified blaster or a Professional Engineer registered or licensed to practise in the Province of New Brunswick, stating that drill pattern and blasting sequences and charges have been designed and performed in accordance with appropriate codes.

  .2 A letter indicating anticipated time(s) of the Day at which blasts will take place.

108.4 CONSTRUCTION

108.4 .1 General

  .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

  .2 The Contractor shall carry out the Work in conjunction with Item 946 and Item 948.

108.4.1 .3 The Contractor shall maintain surface drainage during excavation of cuts and construction of embankments.

.1 Low spots and ruts that could pond water shall be removed no later than the end of each Day's Work or, if rain is imminent, as Work progresses during the Day.

.4 Any surface constructed or exposed by the Contractor, and subjected to through-traffic, shall be maintained in a condition such that traffic can safely travel along it at the speed limit posted for the Work Area.

.5 Transitions in cut and fill conditions, at the ends of the bedrock cuts, shall be carried out as indicated on Standard Drawing 108-1.

.6 Rock cuts and fills shall be shaped in accordance with Item 941.

.7 Blasting will be permitted only between 30 minutes after sunrise and 30 minutes before sunset.

.1 Blasting within 500 m of any residence or business will not be permitted to take place between 7:00 p.m. and 7:00 a.m. Monday to Friday, or on any weekend or public holiday, without prior notification to and approval by the Engineer.

108.4 .2 Excavation

.1 The Contractor shall notify the Engineer when material appearing to be bedrock is first encountered.

.1 The area identified shall be stripped of Overburden and the Engineer will determine the top of bedrock elevation for cross-sectioning.

.2 The Contractor shall be responsible to control the fracturing, excavation and handling the solid rock such that optimum usage of the excavated materials is achieved, as follows:

.1 Fracturing of bedrock shall be carried out so as to produce shattered rock for use as per 108.4.3.1.

.2 The Contractor shall separately excavate or otherwise salvage rock meeting the requirements of 121.2 - Borrow "A", for use in the top 600 mm of the Subgrade.

.3 Where the Contract includes Borrow to be placed in the Work, the Contractor shall conduct his operations such that all usable material resulting from solid rock excavation either has been used or will be used in the Work, prior to the placement of any material under Item 121.

.1 Borrow shall not be placed in areas where excavated materials could be hauled at a lesser cost to the Owner, unless otherwise authorized by the Engineer.

.3 In cuts in bedrock, the Roadbed shall be subexcavated to the specified depth below Subgrade and on a plane parallel to the Subgrade cross-Slope.

108.4.2 .4 Prior to backfilling a bedrock undercut the Roadbed shall be subexcavated to the full width and depth specified, and the ditches shall be excavated to at least the same grade, over the entire length of the bedrock cut or 50 m longitudinally, whichever is the lesser.

.5 The Contractor shall fill any overexcavated areas in the bedrock undercut with finely shattered rock to meet the tolerances specified in Item 941.

.6 Where soil is encountered below Subgrade in a bedrock cut area, subexcavation and backfilling shall be carried out as follows:

  .1 Isolated pockets of soil encountered below Subgrade within a bedrock cut shall be subexcavated as directed by the Engineer and backfilled with finely shattered rock.

  .2 If the Subgrade cross-section is partly in bedrock and partly in soil and constitutes more than pockets of soil in a bedrock Subgrade, the soil shall be subexcavated to match the specified solid rock subexcavation.

    .1 The same type of Borrow A-quality material shall be used to backfill both the bedrock and soil undercuts.

  .3 Where the Subgrade line (longitudinally) is in and out of solid rock and soil, subexcavation of the bedrock and the soil at the transition points shall be as indicated on Standard Drawing 108-1.

.7 Loosened rock shall be removed from the Backslope of bedrock cuts so as to leave a neat and safe condition and the rock so removed shall be utilized in embankment construction.

.8 The Contractor shall shape the ditches, remove any rock knobs that would impede drainage and/or fill any low spots with finely shattered rock, to achieve the specified width and grade.

.9 Naturally occurring boulders, after being measured by the Engineer, shall be placed as directed by the Engineer.

.10 All overhaul shall be subject to the approval of the Engineer.

  .1 Excavated material shall be placed in the nearest embankment(s) so as to minimize the overhaul Quantities, unless otherwise directed by the Engineer.

.11 Excavated material designated by the Engineer as surplus and useable, shall remain the property of the Owner and shall be either stockpiled or otherwise placed in the Work, as directed by the Engineer.

.12 Excavated material designated by the Engineer as waste, shall become the property of the Contractor and shall be disposed of in accordance with Item 947.

108.4 .3 Placement

.1 Rock embankments shall be constructed in lifts not exceeding 1 m in thickness, except for friable rock, for which lift thickness shall not exceed 600 mm.

  .1 Large rocks and boulders shall not be placed in clusters or nests but shall be distributed over the surface of the layer onto which they are pushed and finer rock placed in the voids between them.

  .2 Rock placed as backfill over an undercut in soil or rock, or as the top 600 mm of the Subgrade in an embankment, shall be the rock salvaged under 108.4.2.2.2 and shall contain no fragments greater than 400 mm in any dimension, and voids in the surface shall be filled with rock spalls.

.2 Embankments shall be constructed such that the first lift when shaped forms the toe of the Foreslopes and each successive lift shall be completed to the full width prior to placing the next lift.

  .1 On ungrubbed areas, swamps and rough terrain, the initial lift thickness shall be as approved by the Engineer.

.3 Each lift of rock shall be compacted such that rock fragments are further broken down or repositioned to minimize voids and bridging, and to consolidate the embankment.

  .1 Rock suitable to be placed in a 1 m lift shall be compacted with a vibratory roller of at least 15 t or placed and tramped by a crawler tractor of at least 30 t mass.

  .2 Friable rock shall be compacted with a vibratory roller of a minimum 11 t mass.

.4 Where embankments are constructed against an existing earth sidehill having a Slope steeper than 3:1, for the top 2.5 m below Subgrade, the spreading Equipment shall cut into the sidehill as each lift of fill is placed so that the next lift is "keyed" into the sidehill to a width not less than 1 m.

.5 Where the Work involves placement of material firstly along one side of the Roadbed and then the other side, the spreading Equipment shall cut into the edge of the previously built side of the Roadbed as each lift of material is placed so that the lift is "keyed" into the adjacent side of the Roadbed to a width not less than 0.5 m.

.6 Excavated material placed behind Structures or in areas where Structures are to be constructed shall be a material meeting the requirements of 121.2 - Borrow A, and shall have lift thicknesses as follows:

  .1 Maximum 200 mm behind abutment breastwalls or other earth-retaining Structures, to the limits identified on the Plans; or

  .2 Maximum 300 mm where Structures will be constructed or through which piles will be driven.

108.4.3 .7 No excavated rock shall be placed within 4 m of either side and for the depth where an induced trench will be constructed under Item 169.

108.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of cubic metres of solid rock excavated and either placed, stockpiled or disposed of in accordance with this Item.

.2 The volume of bedrock shall be as measured in situ and computed by the average end area method, based on the top-of-rock sections surveyed by the Engineer, after the bedrock exposure noted in 108.4.2.1.

.1 If the Contractor fails to give notice under 108.4.2.1, then the Engineer will determine the rock line to be used to calculate the Quantity of solid rock excavation.

.2 The payline for the rock undercut surface shall be the theoretical undercut line as per 108.4.2.3, to the intercept of the Foreslope as excavated.

.3 Boulders greater than 1 m^3 in volume shall be measured individually for payment.

.4 Where, in the opinion of the Engineer, Overbreak in ditches and Backslopes has been unavoidable, the Overbreak will be measured for payment up to but not exceeding 10% of the Quantity calculated within the lines staked by the Engineer at the stations at which the Overbreak occurs.

.1 This percentage may be increased at the discretion of the Engineer for stations of small cross-sectional area for which the width of Overbreak is not excessive but represents a relatively large percentage of the area of solid rock excavation staked, and if all of the Overbreak Quantity is useable material.

108.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of solid rock excavation , as identified under the Contract.

.2 The overhaul of material placed in Roadway Work, stockpile(s) or as backfill for Structures, as approved by the Engineer, will be paid for in accordance with Item 808.

.3 Except as indicated in 108.6.2 overhaul will not be paid for material removed under this Item and used under other Items.

116.1 DESCRIPTION

.1 This Item covers the excavation and disposal of material from existing ditches.

116.2 MATERIALS

.1 None identified.

116.3 SUBMITTALS

.1 None identified.

116.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Ditching shall consist of removing vegetal matter and approximately 150 mm of soil from an existing ditch such that the width of the bottom of the ditch is not less than 1 m and the ditch has a continuous smooth grade providing positive gravity drainage, without ponding, in the specified flow direction.

.3 The Contractor shall shape ditches to a uniform width, with no gouges or ridges remaining in the finished Work.

.4 The Contractor shall not excavate or undermine the Foreslope during the course of the Work.

.5 The Contractor shall repair any damage, at his own expense, to adjacent property resulting from the Work.

.6 The materials excavated from within the ditches shall become the property of the Contractor and shall be disposed of outside the Work Site.

.7 A driveway crossing designated to be removed and not replaced shall be excavated so that the ditch and Slopes remaining after excavation match the abutting ditch and Slopes.

.8 Driveways designated for replacement shall be replaced the same Day and in accordance with Item 130 and/or Item 140 utilizing material excavated from the crossing wherever possible.

    .1 Where excavation involves removal of driveway Culverts, the Contractor shall take care to ensure that any existing pipe is not damaged and is salvaged for re-use.

        .1 The Contractor shall notify the Engineer prior to exposing any existing pipe.

        .2 Any pipe determined by the Engineer to be salvageable shall remain the property of the Owner.

116.4.8.1 .3 Salvageable pipe shall be re-used in the Work Site or transported, by the Contractor, to the nearest DOT Maintenance Depot.

.4 Unsalvageable pipe and waste shall become the property of the Contractor and shall be disposed of outside the Work Site.

.5 If the pipe is damaged as a result of the Contractors actions, as determined by the Engineer, the Contractor shall be responsible to replace the pipe.

116.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of ditching carried out in accordance with this Item.

116.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

121.1 DESCRIPTION

.1 This Item consists of supply of material from outside the Work Site, and its placement within the Work Site.

121.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Borrow shall consist of soil and/or rock free of roots, stumps, organics and/or other deleterious substances, and shall meet the following requirements:

  .1 Dust content will be determined in accordance with ASTM C117.

  .2 Borrow A shall have a Dust content not exceeding 25% tested at a minimum frequency of one test per 10,000 t.

    .1 If successive test results indicate a Dust content below 15% the test frequency may be reduced at the discretion of the Engineer.

  .3 Mudstone, claystone and/or siltstone will not be acceptable as Borrow A.

  .4 Borrow A shall have a maximum Plasticity Index of 5.

  .5 Borrow B shall have a Dust content not exceeding 50%.

.3 Borrow shall be subject to the approval of the Engineer at the time of placement in the Work and the maximum particle size shall not exceed two-thirds of the lift thickness being placed.

121.3 SUBMITTALS

.1 The Contractor shall notify the Engineer, in writing, for approval of the source of material, at least 14 Days in advance of obtaining material from the proposed Borrow source.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

121.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work in accordance with Item 946 and Item 948.

.3 The Contractor shall carry out operations at the Borrow source in accordance with Item 922.

.4 Borrow placement shall be carried out in accordance with Item 941.

121.4 .5 If at any time during the Work, the surface becomes rutted or displaced, the Contractor shall make all necessary repairs to reinstate the surface grade.

  .1 The depth rutted and/or displaced shall be scarified, shaped and compacted to meet the requirements of this Item.

.6 The Contractor shall conduct his operations such that all usable material resulting from excavation under Items 106, 107 and/or 108 either has been used or will be used in the Work, prior to the placement of any material under this Item.

.7 Oversize stones (as per 121.2.3) and unsuitable materials from the Borrow placement shall be disposed of so that the Roadway is left in a neat and tidy condition.

.8 The Contractor shall carry out moisture conditioning and compaction of soil Borrow in accordance with Item 936.

  .1 Any isolated soft spots or other areas within the top 1.2 m of the Subgrade not meeting the specified compaction criteria shall be excavated and backfilled with material of the quality matching the surrounding material, and as directed by the Engineer.

.9 The placement of Borrow shall be in lifts and shall conform to lines and grades provided.

  .1 Material placed in the top 600 mm to Subgrade shall meet the requirements of 121.2 - Borrow A and shall be placed, as follows:

    .1 Soil Borrow A shall be placed as specified in 121.4.9.2.1.

    .2 Rock Borrow A shall be placed in one lift using a vibratory roller of at least 11 t mass. Surface voids shall be filled with rock fragments and spalls and compacted such that rock fragments are further broken down or repositioned to minimize voids and bridging, and to consolidate the lift.

    .3 In backfilling of undercuts deeper than 600 mm, the lift thickness shall be as determined by the Engineer.

  .2 Material placed to within 600 mm below Subgrade shall be placed as follows:

    .1 Soil Borrow shall have a maximum lift thickness of 300 mm, and each lift shall be compacted to a minimum of 95% of the maximum dry density.

      .1 The lift thickness may be increased to a maximum of 600 mm if the Contractor can provide proof that the specified density can be achieved throughout the entire lift.

    .2 Rock Borrow shall have a maximum lift thickness of 600 mm, and each lift shall be compacted such that rock fragments are further broken down or repositioned to minimize voids and bridging, and to consolidate the lift, using a vibratory roller of at least 11 t mass.

121.4.9 .3 Borrow placed behind Structures or in areas where Structures are to be constructed shall be soil meeting the requirements of 121.2 - Borrow A and shall be compacted to a minimum of 95% of the maximum dry density for each layer placed as follows:

.1 Material behind abutment breastwalls or other earth-retaining Structures, to the limits identified in the Contract Documents, shall have a maximum lift thickness of 200 mm.

.2 Material over which Structures will be constructed or through which piles will be driven shall have a maximum lift thickness of 300 mm.

.10 Embankments shall be constructed such that the first lift when shaped forms the toe of the Foreslopes and each successive lift shall be completed to the full width prior to placing the next lift.

.1 On ungrubbed areas, swamps and rough terrain, the initial lift thickness shall be as approved by the Engineer.

.11 The Contractor shall maintain surface drainage during the placement of Borrow.

.1 Low spots and ruts that could pond water shall be removed no later than the end of each Day's Work or, if rain is imminent, as Work progresses during the Day.

.12 Where embankments are constructed against an existing earth sidehill having a Slope steeper than 3:1, for the top 2.5 m below Subgrade the spreading Equipment shall cut into the sidehill as each lift of fill is placed so that the next lift is "keyed" into the sidehill to a width not less than 1 m.

.13 Where the Work involves placement of material firstly along one side of the Roadbed and then the other side, the spreading Equipment shall cut into the edge of the previously built side of the Roadbed, as each lift of material is placed so that the lift is "keyed" into the adjacent side of the Roadbed to a width not less than 0.5 m.

.14 Any Borrow surface subjected to through-traffic shall be maintained in a condition such that traffic can safely travel along it at the speed limit posted for the Work Area.

121.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of Borrow supplied and placed in accordance with this Item.

.2 If the Contractor places more Borrow than the tendered Quantity, thereby causing a waste of useable excavated materials under Items 106, 107 and/or 108, the volume of excavated material so wasted shall be calculated and that Quantity deducted from the total Quantity of Borrow.

.1 This volume of material shall be converted to tonnes using 2.0 t/m^3.

121.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each class of Borrow, as identified under the Contract.

130.1 DESCRIPTION

.1 This Item consists of supply and installation of aluminum coated corrugated steel pipe (CSP), aluminum coated corrugated steel pipe-arch (CSPA) and corrugated aluminum alloy pipe (CAP), having an equivalent diameter of 1200 mm or less.

130.2 MATERIALS

.1 All pipe materials shall be supplied by the Contractor.

.2 All pipe and appurtenances shall be manufactured of aluminum coated steel or aluminum alloy and shall meet the requirements of Table 130-1 and Table 130-2.

Table 130-1
Material/Fabrication Standards

Culvert/Structure Type	Material Standard	Fabrication Standard
Aluminum coated steel (pipe)	CSA G401-01 AASHTO M274-87	CSA G401-01 ASTM A929/A929M
Alumimum alloy (pipe)	ASTM B209	ASTM B790/B790M-97
Aluminum Structures (pipe & arch)	ASTM B209 ASTM B221 AASHTO M219-92	ASTM B746/B746M ASTM B789/B789M ASTM B790/B790M

Table 130-2
Standard CSP/CSPA/CAP Dimensions

CSP/CAP Diameter mm	Equivalent CSPA Span x Rise mm	Wall Thickness (mm)		Corrugation Profile mm
		Aluminum	Aluminum Coated	
150		1.6	N/A	38 x 6.5
200		1.6	N/A	38 x 6.5
250		1.6	1.6	38 x 6.5
300		1.6	1.6	68 x 13
400	450 x 340	2.0	1.6	68 x 13
500	560 x 420	2.0	1.6	68 x 13
600	680 x 500	2.8	2.0	68 x 13
700	800 x 580	2.8	2.0	68 x 13
800	910 x 660	2.8	2.0	68 x 13
900	1030 x 740	2.8	2.0	68 x 13
1000	1150 x 820	2.8	2.8	68 x 13
1200	1390 x 970	3.5	2.8	68 x 13

130.2 .3 Couplers shall be aluminum coated steel or aluminum alloy and shall have configurations and fastening systems as indicated in Table 130-3

Table 130-3
CSP/CSPA/CAP Couplers

Equivalent Diameter mm	Type(s) of Coupler	Minimum Thickness	Minimum Width	Types(s) of Fasteners
150 to 250	Flat, Dimple or Corrugated	1.3 mm	150 mm	Wedge or Bolts
300 to 1200	Annular Corrugated	1.6 mm	300 mm	Bolts

130.2 .4 Helical corrugated pipe greater than 250 mm diameter shall have ends re-corrugated to annular corrugations for coupling purposes.

.5 All cut edges and any damage to aluminum coatings shall be ground smooth and recoated in accordance with CSA G401.

.6 Backfill material shall meet the requirements of Table 130-4.

.1 Backfill material shall be obtained from within the Work Site as approved by the Engineer.

.2 If sufficient quantities of suitable backfill material are not available within the Work Site, as determined by the Engineer, additional backfill shall be imported by the Contractor in accordance with Item 167 from a source approved by the Engineer.

Table 130-4
Backfill Classification

Classification	Requirements
Class "A"	well graded granular material composed of clean, uncoated particles free of lumps of clay or other deleterious material, and having not more than 10% retained on the 100 mm sieve, and not more than 10% Dust.

130.3 SUBMITTALS

.1 The Contractor shall submit, upon request, the manufacturer's certification that the materials supplied meet the specified requirements as detailed on the Contract Documents.

.1 If fish weirs/baffles are specified for a Culvert, the Contractor shall submit shop drawings for each Culvert in accordance with 131.3.

.2 The Contractor shall submit, upon request, the proposed source of the supply of the backfill material from within the Work Site.

130.3 .3 If the source of the supply of the backfill material is located outside the Work Site, the Contractor shall identify the proposed source, in writing, for the approval of the Engineer, at least 14 days in advance of obtaining backfill material from the proposed source.

.4 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

130.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 If fish weirs/baffles are specified for a Culvert, the hook bolts shall be isolated from the reinforcement.

.3 The Engineer shall provide control points in the field to provide vertical and horizontal control at selected locations or as may be required.

.4 The Contractor shall be responsible for the layout and maintenance of control for all lines and grades for the Work as shown on the Plans.

.5 The pipe sections shall be joined in a straight line using standard industry methods.

.6 The Contractor shall carry out the Work in accordance with Item 948.

.7 Trench excavation shall be carried out in accordance with 161.4 and to the limits as indicated on the Standard Drawings 161-1 to 161-5.

.8 If Overexcavation occurs, the Contractor shall, at his own expense, repair and fill the Overexcavation with an approved backfill material, placed in accordance with Item 936, and compacted to 95% of the maximum dry density.

.9 Installation shall proceed upgrade.

.10 Backfill shall be placed and shaped to lines and grades as indicated on Standard Drawings 161-1 to 161-5.

.11 No backfill material shall be placed in the excavation until the excavation has been approved by the Engineer, including but not limited to the dimensions of excavation and the character of foundation materials.

  .1 Material over 75 mm in size shall not be placed within 300 mm of any metal pipe.

  .2 Backfill shall be placed in lifts of not more than 200 mm in thickness for vibratory plate or rammer-type compactors and not more than 300 mm in thickness for vibratory rollers.

  .3 Backfill shall be compacted in accordance with Item 936, to a minimum of 95% of the maximum dry density.

130.4 .12 Backfilling of metal pipes shall proceed such that the differential in elevation between the two sides is not more than one lift of backfill.

  .1 Only compactors recommended by the pipe manufacturer shall be used within 1 m of metal pipes.

.13 No traffic or construction equipment shall be permitted to pass over the metal pipe until the limit of backfilling above the pipe has been attained as indicated on Standard Drawings 161-1 to 161-5 and/or in the Contract Documents.

.14 Shoring, bracing, sheeting, pumps, temporary roads and/or bridges that are necessary for the Work shall be employed, maintained and removed by the Contractor.

.15 The Contractor shall construct, maintain and remove suitable temporary construction detours in accordance with Item 918.

130.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of metal pipe supplied and installed in accordance with this Item.

  .1 The measurement shall be taken along the invert of the pipe.

130.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size and type of metal pipe, as identified under the Contract.

.2 The Owner will make partial payment in accordance with 908.7 for metal pipe stored at the Work Site.

  .1 Partial payment will be made for specialized metal pipe acceptably stored at the supplier's yard.

131.1 DESCRIPTION

.1 This Item consists of the supply and placement of aluminum coated corrugated metal pipe, including but not limited to, all CSP and CSPA having an equivalent diameter greater than 1200 mm, structural plate CSP or CSPA (SPCSP or SPCSPA), structural plate arches, aluminum alloy pipe (CAP, SPCAP, SPCAPA), and any other type of metal pipe.

131.2 MATERIALS

.1 All pipe materials shall be supplied by the Contractor.

.2 All pipe and appurtenances shall be manufactured of aluminum coated steel, alumimum alloy or galvanized steel and shall meet the requirements of Table 131-1.

Table 131-1
Material/Fabrication Standards

Culvert/Structure Type	Material Standard	Fabrication Standard
Aluminum coated steel (pipe)	CSA G401-01 AASHTO M274-87	CSA G401-01 ASTM A929/A929M
Alumimum alloy (pipe)	ASTM B209	ASTM B790/B790M-97
Aluminum Structures (pipe & arch)	ASTM B209 ASTM B221 AASHTO M219-92	ASTM B746/B746M ASTM B789/B789M ASTM B790/B790M
Aluminum Structures (box)	ASTM B209 ASTM B221 AASHTO M219-92	ASTM B864/864M-95 ASTM B746/B746M
Galvanized steel (plate arch)	CSA G401-01	CSA G401-01

131.2 .3 Helical corrugated pipe shall have ends re-corrugated to annular corrugations for coupling purposes.

.4 All cut edges and any damage to aluminum coatings or galvanized steel shall be ground smooth and recoated in accordance with CSA G401.

131.3 SUBMITTALS

.1 The Contractor shall submit, in accordance with Item 956, shop drawings for each Culvert, containing but not limited to, the following information:

  .1 Station(s) of pipe(s), name(s) of watercourse(s), and DOT contract number and description.

  .2 General layout showing pipe and appurtenances.

131.3.1 .3 Length and weight (mass) of individual sections.

.4 Itemized supply list.

.2 The Contractor shall submit, in advance of the commencement of the Work, the manufacturer's certification that the materials to be supplied, for the fabrication, meet the specified requirements as detailed in the Contract Documents.

.3 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

131.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Engineer shall provide control points in the field to provide vertical and horizontal control at selected locations or as may be required.

.3 The Contractor shall be responsible for the layout and maintenance of control for all lines and grades for the Work as shown on the Plans.

.4 Excavation, backfilling and backfill shall be carried out in accordance with Items 161, 166 and 167 respectively.

.5 The pipe sections shall be joined in a straight line using standard industry methods.

.6 Pipes shall be assembled and/or erected as shown on the manufacturer's drawings.

.7 The Contractor shall construct, maintain and remove temporary construction detours around the Structure in accordance with Item 918.

131.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of metal pipe supplied and placed in accordance with this Item.

.1 The measurement shall be taken along the invert of the pipe or the bottom edge of an arch at the connection to the foundation.

131.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of metal pipe, as identified under the Contract.

.2 The Owner will make partial payment for metal pipe in accordance with 908.7.

136.1 DESCRIPTION

.1 This Item consists of the supply and installation of subdrain pipe.

136.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Subdrain pipe shall be 150 mm and/or 200 mm diameter perforated pipe, as specified in the Contract Documents, and shall meet the following:

  .1 Galvanized CSP and appurtenances shall be galvanized steel manufactured to meet the requirements of CAN/CSA G401, or

  .2 PVC pipe and appurtenances shall be DR 35 conforming to CAN/CSA B182.2 and perforated as per CAN/CSA B182.1 (Clause 4.1.5), or

  .3 corrugated polyethylene pipe and appurtenances conforming to ASTM F667.

.3 All elbows, caps and reducer sections shall match the grade and quality of the pipe supplied.

.4 Geotextile shall be Type N2 in accordance with 601.2.

.5 Free draining backfill shall be supplied in accordance with 366.2.

136.3 SUBMITTALS

.1 The Contractor shall submit to the Engineer, at least 14 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

136.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 A trench shall be excavated to depths as indicated in the Contract Documents and shall be lined with geotextile of a width sufficient to fit the bottom and sides and, after backfilling, the top of the free draining backfill with a minimum overlap of 200 mm.

.3 Rock encountered within the limits of the excavation shall be excavated in accordance with Item 161.

136.4 .4 The subdrain pipe shall be installed as indicated on Standard Drawing 136-1.

.5 The subdrain shall be installed as a continuous line with all joints being constructed with couplers compatible with the pipe supplied and in accordance with the manufacturer's recommendations.

  .1 The Contractor shall be responsible for all cutting and fitting of pipes in the Work.

  .2 The Contractor shall cut holes in catch basins, when required, at the required elevation and in accordance with 404.4.

.6 The ends of each continuous line of subdrain shall be capped, as required.

  .1 Where the subdrain is to be connected to a precast catch basin, the Contractor shall carefully make an opening in the catch basin at the required elevation, and make the connection as indicated on Standard Drawing 136-1.

.7 The trench shall be backfilled to match the surrounding grade.

.8 The material excavated from the trench shall be spread on the Foreslopes, placed in embankments, or, if it is considered by the Engineer to be unsuitable for such use, it shall become the property of the Contractor and shall be disposed of outside the Work Site.

136.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the linear metres of subdrain supplied and installed in accordance with this Item.

  .1 The measurement shall be taken along the centreline of the pipe from end to end for each continuous section of installation.

136.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size and type of pipe, as identified under the Contract.

SUBDRAIN OUTLET

ITEM: 137

137.1 DESCRIPTION

.1 This Item consists of the supply and installation of subdrain outlets.

137.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Subdrain outlet pipe shall be non-perforated pipe of a size, type and quality to match the subdrain pipe supplied and installed under Item 136.

  .1 Galvanized CSP and appurtenances shall be galvanized steel manufactured to meet the requirements of CAN/CSA G401, or

  .2 PVC pipe shall be DR 35 conforming to CAN/CSA B182.2, or

  .3 corrugated polyethylene pipe and appurtenances conforming to ASTM F667.

.3 Geotextile shall be Type N2 in accordance with 601.2.

.4 Pipe zone material shall conform to the requirements of 415.2.

.5 Free draining backfill shall be supplied in accordance to the requirements of 366.2.

137.3 SUBMITTALS

.1 The Contractor shall submit to the Engineer, at least 14 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

137.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall construct the subdrain outlet Structure in advance of any placement of Aggregate Subbase.

.3 The subdrain outlet shall be constructed as detailed in Standard Drawing 137-1.

.4 The subdrain outlet shall be installed with all joints being constructed with couplers and T-sections compatible with the pipe supplied and in accordance with the manufacturer's recommendations.

  .1 The Contractor shall be responsible for all cutting and fitting of pipes in the Work.

137.4 .5 Material excavated from the outlet trench shall be used for backfill above the pipe zone to Subgrade.

   .1 Pipe zone and trench backfill shall be placed in 300 mm lifts in accordance with Item 936, to a minimum of 95% of its maximum dry density, from the base of the excavation up to 600 mm below Subgrade.

   .2 Trench backfill shall be placed in 300 mm lifts in accordance with Item 936, to a minimum of 95% of its maximum dry density, within the last 600 mm below Subgrade.

   .3 The trench shall be backfilled to match the surrounding grade.

.6 If the material excavated from the trench is considered by the Engineer to be unsuitable for backfill, it shall become the property of the Contractor and shall be disposed of outside the Work Site.

   .1 Replacement backfill material shall be obtained from the Work Site as directed by the Engineer.

137.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of subdrain outlets supplied and installed in accordance with this Item.

137.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size and type of pipe, as identified under the Contract.

140.1 DESCRIPTION

.1 This Item consists of supply and installation of all reinforced concrete pipe having a nominal inside diameter (ID) of 1200 mm or less.

140.2 MATERIALS

.1 All pipe materials shall be supplied by the Contractor.

.2 All reinforced concrete pipe shall meet the requirements of either ASTM C76, ASTM C655 or CAN/CSA A257.2 and CAN/CSA A257.3.

.3 Pipe of 1050 mm and 1200 mm nominal ID shall have a minimum 70 mm diameter lift hole at the centre of gravity, and shall be equipped with a tapered concrete or rubber plug that does not protrude beyond the inside wall of the pipe.

    .1 Pipe made with elliptical reinforcement shall have the lift hole located so as to establish the top of the pipe, and for pipe having baffles and weirs, such that it is centred over the top of the baffle or weir.

.4 Tension rod/bar assemblies shall be supplied as indicated in Standard Drawing 140-1 for pipes specifically identified in the Contract Documents.

.5 Tee-base sections, elbow sections and/or other appurtenances shall be supplied as indicated in the Contract Documents.

    .1 Tee-bases shall be fabricated such that when installed at the slope indicated in the Contract Documents, the catch basin shaft on the Tee-base is vertical.

    .2 Weirs/baffles shall be reinforced and secured to the pipe invert by a method approved by the Engineer and moist cured for a minimum of 3 days.

.6 Backfill material shall meet the requirements of Table 140-1.

Table 140-1
Backfill Classification

Classification	Requirements
Class "A"	well graded granular material composed of clean, uncoated particles free of lumps of clay or other deleterious material, and having not more than 10% retained on the 100 mm sieve, and not more than 10% Dust.
Class "B"	well graded granular material having not more than 10% retained on the 100 mm sieve, and not more than 35% Dust.

140.2.6 .1 Class "A" shall be used for backfilling 1050 mm and 1200 mm diameter concrete pipes.

.2 Class "B" shall be used for backfilling concrete pipes 900 mm or smaller in diameter.

.3 Backfill material shall be obtained from within the Work Site as approved by the Engineer.

.4 If sufficient quantities of suitable backfill material are not available within the Work Site, as determined by the Engineer, additional backfill shall be imported by the Contractor in accordance with Item 167 from a source approved by the Engineer.

140.3 SUBMITTALS

.1 The Contractor shall submit, upon request, the manufacturer's certification that the materials supplied meet the specified requirements as detailed on the Contract Documents.

.2 The Contractor shall submit, upon request, the proposed source of the supply of the backfill material from within the Work Site.

.3 If the source of the supply of the backfill material is located outside of the Work Site, the Contractor shall submit the proposed source, in writing, for the approval of the Engineer, at least 14 Days in advance of obtaining backfill material from the proposed source.

.4 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

140.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Engineer shall provide control points in the field to provide vertical and horizontal control at selected locations or as may be required.

.3 The Contractor shall be responsible for the layout and maintenance of all lines and grades for the Work.

.4 Trench excavation shall be carried out in accordance with 161.4 and to the limits as indicated on Standard Drawings 161-1 to 161-5, or in the case of an induced trench as specified in the Contract Documents.

  .1 If Overexcavation occurs, the Contractor shall, at his own expense, repair and fill the Overexcavation with an approved backfill material, placed in accordance with Item 936, and compacted to 95% of the maximum dry density.

.5 The pipe sections shall be joined in a straight line using standard industry methods, proceeding upgrade with bell end upgrade.

140.4 .6 The maximum joint gap between any two concrete pipe sections shall be 13 mm.

   .1 Where the joint gap exceeds 13 mm, sections shall be removed and reset to meet the specified tolerance.

.7 Tension rod/bar assemblies shall be installed as indicated in Standard Drawing 140-1 and in the Contract Documents.

.8 All other appurtenances shall be installed as indicated in the Contract Documents.

   .1 Pipe sections with weirs or baffles shall be installed with the weir/baffle tops horizontal in the transverse direction.

.9 Backfill shall be placed and shaped to lines and grades as indicated on Standard Drawings 161-1 to 161-5.

   .1 If the pipe will have an induced trench constructed over it under Item 169, backfill shall be placed and shaped as noted in the Contract Documents.

.10 No backfill material shall be placed in the excavation until the excavation has been approved by the Engineer, including but not limited to the dimensions of excavation and the character of foundation materials.

   .1 Material over 75 mm in size shall not be placed within 300 mm of any concrete pipe.

   .2 Backfill shall be placed in lifts of not more than 200 mm in thickness for vibratory plate or rammer-type compactors and not more than 300 mm in thickness for vibratory rollers.

   .3 Backfill shall be compacted in accordance with Item 936, to a minimum of 95% of the maximum dry density.

.11 Backfilling of concrete pipe shall proceed simultaneously and evenly on both sides of the Structure and shall never exceed 600 mm in differential elevation.

.12 No traffic or construction equipment shall be permitted to pass over the concrete pipe until the backfill cover indicated on Standard Drawings 161-1 to 161-5 and/or in the Contract Documents has been placed.

.13 Shoring, bracing, sheeting, pumps, temporary roads and/or bridges that are necessary for the Work shall be employed, maintained and removed by the Contractor.

.14 The Contractor shall construct, maintain and remove suitable temporary construction detours in accordance with Item 918.

140.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of reinforced concrete pipe supplied and installed in accordance with this Item.

  .1 The measurement shall be taken along the invert of the pipe.

140.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of reinforced concrete pipe, as identified under the Contract.

.2 The Owner will make partial payment in accordance with 908.7 for reinforced concrete pipe stored at the Work Site.

  .1 Partial payment will be made for specialized reinforced concrete pipe acceptably stored at the supplier's yard.

141.1 DESCRIPTION

.1 This Item consists of the supply and placement of all reinforced concrete pipe of a nominal ID greater than 1200 mm.

141.2 MATERIALS

.1 All pipe materials shall be supplied by the Contractor.

.2 All reinforced concrete pipe shall meet the requirements of either ASTM C76, ASTM C655 or CAN/CSA A257.2 and CAN/CSA A257.3.

.3 Tension bar assemblies shall be supplied as indicated in Standard Drawing 140-1 for pipes specifically identified in the Contract Documents.

.4 All pipes shall be supplied with gaskets (confined "O" ring with lubricant, or single offset type).

.5 Tee-base sections and all other appurtenances shall be supplied as indicated in the Contract Documents.

  .1 Tee-bases shall be fabricated such that when installed at the slope indicated in the Contract Documents, the catch basin shaft on the Tee-base is vertical.

  .2 Weirs/baffles shall be reinforced and secured to the pipe invert by a method approved by the Engineer and moist cured for a minimum of 3 days.

.6 Pipe shall have a minimum 70 mm diameter lift hole at the centre of gravity, and shall be equipped with a tapered concrete or rubber plug that does not protrude beyond the inside wall of the pipe.

  .1 Pipe made with elliptical reinforcement shall have the lift hole located so as to establish the top of the pipe, and for pipe having weirs or baffles, such that it is centred over the top of the weir or baffle.

141.3 SUBMITTALS

.1 The Contractor shall submit, in accordance with Item 956, shop drawings for each Culvert, containing but not limited to, the following information:

  .1 Station(s) of pipe(s), name(s) of watercourse(s), and DOT contract number and description.

  .2 General layout showing pipe and appurtenances.

  .3 Length and weight (mass) of individual sections.

  .4 Joint details.

  .5 Details of reinforcing steel for each individual cage shall include wire sizes for cages and stirrups, and reinforcement for weirs and baffles.

  .6 Compressive strength of concrete.

141.3 .2 The Contractor shall submit, upon request, the manufacturer's certification that the materials supplied meet the specified requirements as detailed on the Contract Documents, including Three-Edge Bearing Test results.

.3 The proposed mix proportions (design), shall be submitted to the Engineer at least 14 Days before concrete production is due to start.

.4 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

141.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Concrete cover for pipe reinforcing steel shall be 25 mm ± 6 mm.

.3 The Contractor shall ensure that the manufacturer notifies the Engineer at least 5 Days in advance of commencing any phase of the manufacture to allow for scheduling the DOT inspection.

.4 The manufacturer shall ensure that safe working conditions exist for the Engineer.

.5 Before delivery of any Culvert sections the manufacturer shall, on a minimum of 5 Days notice to the Engineer, perform D-load testing (Three-Edge Bearing Test) in the presence of the Engineer.

  .1 The Three-Edge Bearing Test shall be performed to determine the load to produce a 0.3 mm crack.

  .2 For the Three-Edge Bearing Test, the Engineer will select at random one section per size and class of pipe from among those produced for the Contract or supplied from stock. If no 0.3 mm crack has developed at the D-load specified for the size and class of pipe tested, further load shall be applied until a 0.3 mm crack develops or a load five percent greater than the specified load is reached, whichever occurs first.

  .3 The manufacturer shall clearly mark all test sections of pipe as TESTED and those test sections having failed marked REJECT.

  .4 In the event of disagreement between the manufacturer/supplier and the Owner in verification of the 0.3 mm crack on a Culvert section being tested, that section shall be D-loaded to its failure.

.6 The Engineer shall provide control points in the field to provide vertical and horizontal control at selected locations or as may be required.

.7 The Contractor shall be responsible for the layout and maintenance of all lines and grades for the Work as shown on the Plans.

141.4 .8 Excavation, backfilling and backfill shall be carried out in accordance with Items 161, 166 and 167 respectively.

.9 Pipes shall be placed as shown on the manufacturer's drawings.

.10 The pipe sections shall be joined in a straight line using standard industry methods, proceeding upgrade with bell end upgrade.

.11 The maximum joint gap between any two concrete pipe sections shall be 13 mm for pipes less than 1800 mm in diameter, and 20 mm for pipes 1800 mm and over in diameter.

  .1 Where the joint gap exceeds the above tolerances, sections shall be removed and reset to meet the specified tolerance.

.12 Sections of concrete pipe having been marked as having been tested for D-loading (CAN/CSA A257.2) shall be placed only at the inlet or outlet end of the Work.

.13 Gaskets shall be installed in accordance with the pipe manufacturer's instructions.

  .1 All other appurtenances shall be installed as shown on the Plans.

.14 Pipe sections with weirs or baffles shall be installed with the weir/baffle tops horizontal in the transverse direction.

.15 The Contractor shall construct, maintain and remove temporary construction detours around the Structure in accordance with Item 918.

141.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of reinforced concrete pipe supplied and placed in accordance with this Item.

  .1 The measurement shall be taken along the invert of the pipe.

141.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of reinforced concrete pipe, as identified under the Contract.

.2 The Owner will make partial payment for reinforced concrete pipe in accordance with 908.7.

142.1 DESCRIPTION

.1 This Item consists of the supply and placement of precast concrete box Culvert section(s).

142.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Concrete shall meet the requirements of CSA A23.1 and CSA A23.2.

.3 Joint waterproofing material shall be Rub'r-Nek and Conwrap, or Engineer-approved equivalents, with primers if recommended and approved by the manufacturer.

.4 The calcium nitrite corrosion inhibitor shall conform to the following:

  .1 The dosage rate shall be 25 L/m^3.

  .2 The corrosion inhibiting calcium nitrite admixture shall be manufactured by a firm with a minimum of five years infield experience in the use of corrosion inhibitors for concrete and shall contain between 30% to 36% calcium nitrite by weight of solution.

  .3 The calcium nitrite shall be added at the concrete ready mix plant and verification shall be provided to the Engineer for the quantity of the calcium nitrite added to each batch of concrete.

    .1 Acceptable verification shall include, but is not necessarily limited to, printouts from computerized batch plants or printouts from computerized admixture dispensing units.

    .2 Verification shall be provided on the delivery slip.

.5 Dowels for attachment of cut-off walls to bevelled ends shall be 20 M bars.

.6 Reinforcing steel shall be rebar conforming to 304.2 and/or welded deformed steel wire fabric conforming to ASTM A82, A185, A496 and A497.

.7 Weirs/baffles shall be reinforced and secured to the pipe invert by a method approved by the Engineer and moist cured for a minimum of 3 days.

.8 Nonshrink grout shall conform to ASTM C1107.

.9 Levelling sand shall be clean, non-plastic, free of deleterious materials and shall be a natural or manufactured crusher Dust obtained from crushing bedrock.

  .1 Sand (including crusher Dust) shall meet the grading limits as shown in Table 142-1, when tested in accordance with ASTM C136.

Table 142-1
Grading Requirements for Levelling Sand

ASTM Sieve Size	Percent Passing
9.5 mm	100
4.75 mm	95 to 100
2.36 mm	80 to 100
1.18 mm	50 to 90
600 μm	25 to 65
300 μm	10 to 35
150 μm	2 to 10

.10 Lifting anchorage devices shall be Dayton Superior Swift Lift Systems or equivalent, of sufficient capacity for handling and placing the Culvert sections.

.11 Rigid sheets (boards, plywood, sheet metal or similar) for placing under joints shall be of sufficient durability so as to allow adjacent Culvert sections to slide into place.

  .1 The supplied rigid sheets shall be of a length to extend beyond each side of the box Culvert.

142.3 SUBMITTALS

.1 The Contractor shall submit, in accordance with Item 956, shop drawings for each precast concrete box Culvert, containing but not limited to, the following information:

  .1 Station of culvert, name of watercourse, and DOT Contract number and description.
  .2 General layout showing all box culvert sections and appurtenances.
  .3 Length and weight (mass) of individual sections.
  .4 Joint details (including gap, gasket and waterproofing).
  .5 Proposed construction joints (if sections not cast monolithically).
  .6 Location and type of inserts and lift anchors.
  .7 Location of reinforcement.
  .8 Bar schedules per box section and per weir/baffle.
  .9 Itemized supply list.
  .10 Detail showing year of fabrication embedded in the headwalls.

.2 The proposed mix proportions (design), shall be submitted to the Engineer for review at least 14 Days before concrete production is due to start.

.3 The Contractor shall submit, in advance of the commencement of the Work, the manufacturer's certification that the materials to be supplied for the fabrication meet the specified requirements.

.4 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

142.4 CONSTRUCTION

142.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall comply with the requirements of CSA A23.4 and A251 with respect to fabrication, transportation, storage and delivery of the precast concrete box Culvert elements.

  .1 The reinforcement shall have a minimum concrete cover of 50 mm or a minimum concrete cover of 75 mm for a marine environment. A minimum concrete cover of 13 mm is required for the ends of longitudinal steel.

.3 Manufacturers and erectors of precast concrete elements need not be certified by CSA as meeting requirements of CSA A251; however, all aspects of precast concrete work shall comply with CSA A23.1 and CSA A23.4 and shall be to the approval of the Engineer.

.4 Manufacture of the box Culvert sections shall not commence until the Shop Drawings have been reviewed by the Engineer.

  .1 The Engineer's written notice of review of the Shop Drawings will in no way relieve the manufacturer of the responsibility for correctness of dimensions, size of components and details of fabrication in accordance with 142.3.1.

.5 The Contractor shall ensure that the manufacturer notifies the Engineer at least 5 Days in advance of the commencement of any phase of the manufacture so that the DOT-assigned inspector can be scheduled.

  .1 The Inspector shall have the right to inspect the manufacture of the precast sections, and the authority to order the Work to stop if it does not conform to the Plans, Shop Drawings or Specifications.

  .2 The manufacturer shall ensure that safe working conditions exist for the Inspector.

.6 Shop drawings may show a design with wall and slab thicknesses different from those on the Plans, but the inside dimensions (ID) of the span and the rise shall not be less than those so indicated.

.7 The cured Culvert sections shall be fitted horizontally at the plant to an ungasketed gap of 10 mm or less, and the joints so fitted shall be match marked to ensure proper fit at the Work Site.

142.4 .2 Culvert Design

.1 Box culvert design shall be in accordance with the latest editions of AASHTO Standard Specifications for Highway Bridges and ASTM C1433, for the worst-case loading of either 0.7 m of earth fill or finished grade plus 1.0 m of earth fill.

  .1 Earth fill material shall have a design density of 2.15 t/m^3 and a soil structure interaction factor of 1.15.

.2 The live loading shall conform to CS-700 live loading.

142.4 .3 Forms

.1 Forms shall be of a configuration to ensure compliance with the allowable tolerances.

.2 Forms shall be clean and free of mortar prior to application of form coating.

.3 Forms shall be complete and inspected by the Engineer before placing of concrete shall be permitted.

.4 Permanently exposed sharp edges shall be chamfered with triangular fillets, 12.5 mm by 12.5 mm, made of steel, plastic, or clear, straight-grained wood placed on the side exposed to concrete.

142.4 .4 Material Testing

.1 Sampling, test cylinders and air content tests shall be performed in accordance with CSA A23.2 at 10% and 90% of the discharge load and as follows:

  .1 A test is defined as 2 cylinders to be broken at 28 Days.

  .2 For dry-cast Culvert sections, the air content will be tested on every section and one test (2 cylinders) will be taken on every second Culvert section.

  .3 For wet-cast Culvert sections the air content and two tests (2 sets of 2 cylinders) shall be taken on every Culvert section.

142.4 .5 Curing and Protection of Concrete

.1 Moist curing of the concrete elements shall be carried out naturally or artificially accelerated by the use of heat, until the design strength is reached.

.2 Artificially accelerated curing of the concrete elements shall be in accordance with CSA A23.4 and the following:

  .1 The elements shall be maintained on the casting bed in an approved enclosure that ensures full circulation of thoroughly saturated air and/or steam around the elements with a minimum loss of moisture and heat.

142.4.5.2 .2 During the initial curing period (typically 4 to 5 hours after casting) the enclosure temperature shall be kept at approximately 20 °C.

.3 For the next stage of curing, the enclosure temperature shall be raised at a rate not to exceed 15 °C per hour, to a temperature between 40 and 60 °C that does not vary more than 5 °C.

.4 Steam, radiant heat or forced air used for accelerated curing shall not be applied before the initial set; shall provide excess moisture for proper hydration of the cement; and shall not be applied directly to the concrete, forms or cylinders.

.5 The exposed surfaces of the concrete shall have an excess of moisture during the entire curing period. Water applied for this purpose shall have a temperature that varies no more than 10 °C from the concrete temperature, and in no case shall exceed 60 °C.

.6 The Contractor/Manufacturer shall provide a continuous record of curing temperatures for the entire curing period by means of approved accurate automatic recording devices, spaced one per element to record the temperature throughout the length of the curing enclosure(s).

.7 When an element has reached its required strength the enclosure temperature shall be lowered at a rate of 15 °C per hour to the ambient air temperature.

.8 Elements shall not be exposed to freezing temperatures until they have dried 2 Days in warm temperatures following curing, and cooled at not more than 5°C per hour to the outside air temperature.

142.4 .6 Finishing of Concrete Surfaces

.1 All surfaces of the precast elements shall receive an "Ordinary Surface Finish" in accordance with 302.4.11.3.

.2 Immediately after the removal of forms, any part of the Work which displays defects shall be clearly marked and the Contractor shall notify the Engineer of the location and extent of the defect for his review.

  .1 The Contractor shall submit a repair procedure for approval.

    .1 Cement washes of any kind shall not be used.

    .2 All defects shall be finished smooth, uniformly colour matched and flush with the adjacent surface.

.3 All ridges occurring at junctions of form panels shall be ground smooth.

.4 Exposed ends of lifting devices that have been cut off shall be painted with an approved coating to prevent rusting.

142.4 .7 Culvert Placement

.1 Following placement and backfilling of the cut-off wall, the top horizontal surface of the cut-off wall shall be "buttered" with a 25 mm layer of nonshrink grout and the bevelled end section shall be immediately set into place on the cut-off wall.

.2 Immediately following placement of the end section, 25 mm diameter holes shall be drilled through the prefabricated inserts to a nominal depth of 150 mm into the cut-off wall.

.3 The dowels shall be inserted and grouted into place using the nonshrink grout.

.4 The Contractor shall place a minimum thickness of 50 mm of bed levelling material, compacted and raked or screeded to provide a uniform bedding surface, over the entire foundation area of the Culvert.

.5 A rigid sheet shall be installed flush with the bed levelling material surface and centred under each joint of the Culvert sections, such that when sections are joined, sand and other materials are prevented from entering and contaminating the joint.

.6 Precast concrete box Culvert sections shall be erected in the sequence indicated on the manufacturer's shop drawings.

  .1 Deviation from the manufacturer's shop drawings will not be permitted without the written authorization of the Engineer.

.7 Placement shall proceed upgrade with the female end upgrade.

.8 The maximum joint gap between any two box Culvert sections shall be 20 mm uniformly across the joint with the sections in straight alignment.

  .1 Sections set to a joint gap greater than 20 mm shall be removed and reset to the specified gap.

  .2 Sections which cannot be reset as per 142.4.7.8 will be rejected.

.9 After satisfactory placement of the Culvert sections the lifting hook pockets shall be filled with nonshrink grout.

.10 Joint waterproofing material and appurtenances shall be installed in accordance with the manufacturer's specifications.

.11 No traffic or Equipment shall be allowed to cross over the installed box Culvert until a minimum of 1000 mm of backfill material has been placed over the box Culvert in the area of crossing.

142.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of precast concrete box Culvert supplied and installed in accordance with this Item.

  .1 The measurement shall be taken along the inside bottom centreline of the box Culvert from end section to end section.

142.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of precast concrete box Culvert, as identified under the Contract.

.2 The Owner will make partial payment for precast concrete box Culvert in accordance with 908.7.

161.1 DESCRIPTION

.1 This Item consists of excavation necessary for the construction and/or removal of Structures, and placement of materials within the Work Site , or disposal outside the Work Site.

.2 Foundation Excavation is classified by the type(s) of material encountered as indicated in Table 161-1.

Table 161-1
Definition of Foundation Excavation by Type

A	Foundation excavation of common material as defined by Item 106
B	Foundation excavation of unclassified material as defined by Item 107
C	Foundation excavation of solid rock as defined by Item 108

161.2 MATERIALS

.1 None identified.

161.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

161.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Excavation shall be carried out to the dimensions as indicated on Standard Drawings 161-1 to 161-7, unless otherwise indicated in the Contract Documents.

.3 For induced trench locations (to be completed under Item 169), the Contractor shall carry out the excavation to the dimensions indicated in the Contract Documents.

.4 The Contractor shall not commence any excavation until the Owner's initial cross-section survey is complete for the Work Area involved.

.5 The Contractor shall immediately notify the Engineer when bedrock or boulders are encountered.

.6 Shoring, bracing, sheeting, pumps, temporary roads and/or Bridges that are necessary for the Work shall be employed, maintained and removed by the Contractor.

.7 The Contractor shall carry out the Work in accordance with Item 948.

161.4 .8 Excavated materials that meet the requirements of 167.2 shall be used as backfill.

.9 Excavated materials not required or unsuitable for backfill shall be utilized as directed by the Engineer and as follows:

.1 For embankment construction within the Work Site and placed in accordance with 106.4, 107.4 and/or 108.4.

.2 Material identified by the Engineer as waste shall become the property of the Contractor and shall be disposed of in accordance with Item 947.

.3 All overhaul shall be subject to the approval of the Engineer.

.10 Where foundation excavation involves removal of existing Culverts, the Contractor shall take care to ensure that any existing pipe is not damaged during excavation and is salvaged for re-use.

.1 The Contractor shall notify the Engineer prior to exposing any existing pipe.

.2 Any pipe determined by the Engineer to be salvageable shall remain the property of the Owner.

.3 Salvageable pipe shall be re-used in the Work Site or transported, by the Contractor, to the nearest DOT Maintenance Depot.

.4 Unsalvageable pipe and waste shall become the property of the Contractor and shall be disposed of outside the Work Site.

.5 The Contractor shall be responsible to replace the pipe which is damaged, where such damage is the result of the Contractor's actions, as determined by the Engineer.

.11 Where the Finished Grade is the same as the existing Pavement surface, the Pavement shall be cut in a straight line to a straight edge on each side of the trench or hole and removed separately from the underlying material.

.1 The Contractor shall break down the Pavement pieces to a size small enough to be suitable for use in embankment construction.

.2 Any existing Aggregate Base/Subbase shall be excavated and stockpiled separately from Subgrade materials for re-use under 166.2 at the Work Area.

.12 The Contractor shall notify the Engineer after the excavation is completed.

.13 No backfill material, formwork, pipe or other Structure(s) shall be placed in the excavation until the excavation has been approved by the Engineer, including but not limited to the dimensions of the excavation and the nature of the foundation materials.

.14 The bottom of the foundation excavation for footings founded on solid rock shall be cleaned of all loose rock and soil.

161.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of cubic metres excavated in accordance with this Item.

.2 The volume shall be calculated from the dimensions shown on the Standard Drawings and/ or the Contract Documents.

.3 If Foundation Excavation types "A" and "C" have been tendered, any overlying common material shall be removed sufficiently to allow the Engineer to take measurements of the bedrock surface before any blasting or excavation of the bedrock takes place.

  .1 Boulders shall be excavated when encountered and separated for the Engineer to measure before disposal.

161.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of excavation, as identified under the Contract.

.2 The overhaul of material, as approved by the Engineer, shall be paid for in accordance with Item(s) 806, 807 and/or 808, as applicable.

166.1 DESCRIPTION

.1 This Item consists of the placement of backfill material around a Structure.

166.2 MATERIALS

.1 Suitable material obtained from the excavation within the Work Site and meeting the requirements of 167.2 shall be used for backfilling around Structures.

  .1 Class "A" backfill shall be used for backfilling metal Culverts (pipes), concrete pipes over 900 mm in diameter and concrete box Culverts.

  .2 Class "B" backfill shall be used for backfilling catch basins, footings, and concrete pipes 900 mm or smaller in diameter.

.2 Additional backfill, if authorized by the Engineer, shall be supplied in accordance with Item 167.

166.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

166.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Backfilling to be carried out to the lines and grades as indicated on Standard Drawings 161-1 to 161-7, unless otherwise indicated in the Contract Documents.

.3 If the Structure being backfilled is to be constructed with an induced trench design, additional specific backfilling requirements, as noted in the Contract Documents, shall apply.

.4 No backfill material shall be placed in the excavation until the excavation has been approved by the Engineer, including but not limited to the dimensions of excavation and the nature of foundation materials.

  .1 Material over 75 mm in size shall not be placed within 300 mm of any Structure.

  .2 Backfill shall be placed in lifts of not more than 200 mm in thickness for vibratory plate or rammer-type compactors and not more than 300 mm in thickness for vibratory rollers.

  .3 Backfill shall be compacted in accordance with Item 936, to a minimum of 95% of the maximum dry density.

166.4 .5 Only compactors recommended by the pipe manufacturer shall be used within 1 m of metal pipes.

.6 Backfilling of Structures shall proceed simultaneously and evenly on both sides of the Structure and shall never exceed 600 mm in differential elevation.

.7 No traffic or construction Equipment shall be permitted to pass over the Structure until the backfill cover indicated on the Standard Drawings 161-1 to 161-5 and/or in the Contract Documents has been placed.

.8 Shoring, bracing, sheeting, pumps, temporary roads and/or Bridges that are necessary for the Work shall be employed, maintained and removed by the Contractor.

166.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the volume in cubic metres of backfilling around a Structure carried out in accordance with this Item.

.2 The volume shall be calculated from the dimensions shown on the Standard Drawings and/ or the Contract Documents.

166.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

.2 Overhaul of suitable material obtained from the excavation within the Work Site, as approved by the Engineer, shall be paid in accordance with Item(s) 806, 807, and/or 808, as applicable.

167.1 DESCRIPTION

.1 This Item consists of supplying backfill obtained from outside the Work Site.

167.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 It shall be the responsibility of the Contractor to provide the pit and/or quarry source for supply unless the source of the materials is specified in the Contract Documents.

.3 Backfill for Structures shall satisfy the requirements for the material type and the gradation as indicated in Table 167-1.

Table 167-1
Backfill for Structures

Class	Description
A	Class "A" backfill shall be a well graded granular material composed of clean, uncoated particles free of lumps of clay or other deleterious material, and having not more than 10% retained on the 100 mm sieve, and not more than 10% Dust.
B	Class "B" backfill shall be a well graded granular material having not more than 10% retained on the 100 mm sieve, and not more than 35% Dust.

167.3 SUBMITTALS

.1 The Contractor shall submit the proposed backfill source, in writing, for the approval of the Engineer, at least 14 Days in advance of obtaining material from the proposed source.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

167.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall supply the specified material(s) to the Work Area.

167.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of backfill supplied in accordance with this Item.

167.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each class of backfill, as identified under the Contract.

.2 Haulage for backfill, as approved by the Engineer, will be paid for in accordance with Item 801.

169.1 DESCRIPTION

.1 This Item consists of the construction of an induced trench.

169.2 MATERIALS

.1 All material shall be supplied by the Contractor.

.2 Backfill material shall be a lightweight product of a consistent nature, and supplied in a loose, dry, unconsolidated fashion.

  .1 The Engineer has approved the backfill materials listed in Table 169-1 for use in the Work.

Table 169-1
Approved Backfill Materials

Product
Sawdust
Wood chips
Rubber tire chips
Expanded Polystyrene
Loose hay or straw
Baled hay or straw (cut strings)

169.3 SUBMITTALS

.1 None identified.

169.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall construct the induced trench only after the installation of the pipe and the embankment construction have been completed to the specified elevation and dimensions as indicated in the Contract Documents.

.3 The Contractor shall excavate a trench in the embankment surface along the centreline of the pipe to the specified dimensions and depth as indicated in the Contract Documents.

  .1 The material excavated from the trench shall be incorporated into the surrounding embankment.

  .2 The excavation shall have a tolerance of ±20 mm in depth and a tolerance of ± 10% in width on each side.

169.4 .4 The Contractor shall excavate the trench such that the sides of the trench stand vertically.

  .1 If the trench walls show signs of sloughing, it shall be the Contractor's responsibility to design, supply and install shoring to maintain the trench walls in a vertical state.

.5 The trench shall be completely backfilled with the approved material which shall not be compacted.

  .1 The Contractor shall not leave any of the trench open at the end of any Day's operation.

  .2 If shored, the Contractor shall remove the shoring from the trench after backfilling.

.6 The Contractor shall place a minimum of 600 mm of embankment material (under the applicable Item) over the induced trench prior to permitting construction traffic to use the Work Area.

169.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the volume in cubic metres of induced trench constructed in accordance with this Item.

  .1 The volume shall be calculated from the dimensions shown in the Contract Documents.

169.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

182.1 DESCRIPTION

.1 This Item consists of supply and installation of chain link fence and gates.

182.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Chain link fence and appurtenances shall meet the requirements of CAN/CGSB 138.1 and 138.2.

  .1 Chain link fence gates and fittings shall meet the requirements of CAN/CGSB 138.4.

.3 The fence fabric shall be chain link, 50 mm mesh, constructed of 3.5 mm steel wire, galvanized, Type 1, Class A, Style 2, Grade 2.

  .1 The top selvedge of the fabric shall be twisted and the bottom selvedge shall be knuckled.

.4 Posts and rails shall be Schedule 40, scale-free, hot-dipped galvanized tubular steel pipe as indicated on Standard Drawing 182-1, and as follows;

  .1 Line posts shall be 60 mm OD, 4.0 mm wall thickness and a minimum 5.45 kg/m mass.

  .2 Terminal (gate, end, corner and straining) posts shall be 89 mm OD, 5.5 mm wall thickness and a minimum 11.28 kg/m mass, supplied with stretching bands and bars for attaching the fabric to the posts, and bands for attaching the braces.

  .3 Top rails shall be 43 mm OD, 3.6 mm wall thickness and a minimum 3.38 kg/m mass, supplied with sleeves that allow for contraction and expansion at the top rail joints.

.5 All nuts, bolts, parts and fittings shall be hot-dipped galvanized steel, or aluminum alloy.

.6 Concrete shall meet the requirements of Item 301.2, class of exposure F-1.

  .1 Cement shall be Type 10 (normal).

  .2 The concrete mix design shall incorporate a minimum cement content of 380 kg/m^3, and a non-corrosive, non-chloride accelerator and an air-entraining admixture.

.7 Concrete form tubes shall be coated, spiral wound, wood fibre paper board manufactured with a waterproof glue, and supplied with a minimum length of 1.22 m and of a diameter as indicated on Standard Drawing 182-1.

.8 The Contractor shall supply all other appurtenances and miscellaneous metals as required and as indicated in the Standard Drawings 182-1 and 182-2.

182.3 SUBMITTALS

.1 The Contractor shall submit, in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements, and the manufacturer's recommended procedures for installation and instructions for handling.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

182.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All Work shall be carried out in accordance with the Standard Drawings 182-1 and 182-2.

.3 Prior to the construction of the chain link fence, the Contractor shall remove any debris and correct minor ground undulations (greater than 0.3 m vertical in a 3 m length) which would interfere with the proper construction of the fence in its required location.

.4 All fence grades shall be subject to the approval of the Engineer.

.5 All posts installed in soil shall be centred and vertically embedded in the concrete placed in a concrete form tube forming the boundary of the excavated hole formed by augering.

  .1 Any void space that results between the concrete form tube and the excavated hole that is less than 20% of the OD of the concrete form tube shall be backfilled with well compacted sand backfill prior to placing the concrete.

  .2 If the void is greater than 20% of the OD of the concrete form tube, then the concrete form tube shall be removed and the hole shall be backfilled with compacted excavated material and the post shall be repositioned to meet 182.4.5 or 182.4.5.1.

.6 All concrete shall be placed in accordance with 301.4.

.7 If posts are placed in solid rock, then the footings shall be constructed as indicated on Standard Drawing 182-1.

.8 Line posts shall be placed vertically, and in line at a uniform spacing not exceeding 3 m.

  .1 If an obstruction or major ground elevation difference prevents placing a post at 3 m from an adjacent post, the post may be placed not less than 2.4 m from the next post and in no case more than 3 m.

.9 A corner post shall be installed wherever the fence line changes direction by more than 10°, and a straining post at changes in elevation of more than 30°.

.10 Top rails, braces and appurtenances shall be installed in accordance with the manufacturer's recommended procedures.

182.4 .11 Terminal posts shall be braced by a centre rail of the same material and size as the top rail, between the gate, corner or end post and the adjacent post.

.12 The fence fabric shall be installed on the outside of the line posts and top rail, continuous between terminal posts and stretched tightly and uniformly but not to such a degree that the diamond pattern is distorted.

.13 Lengths of fabric shall only be joined by splicing, using the manufacturer's approved splicing wire system such that a continuous diamond mesh pattern results.

  .1 Splicing by overlap will not be permitted.

.14 At all end, corner and gate posts the fabric shall be broken and secured to the posts by a steel stretching bar and stretching bar bands as indicated in the manufacturer's recommended procedures.

.15 The bottom tension wire shall be strung tight on the outside of the line posts at the diamond pattern, fastened to the fabric by a twisted wire or enclosed in a fabric knuckle.

182.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of chain link fence including gates, if any, supplied and installed in accordance with this Item.

.2 The length shall be taken along the top of the fence from terminal post to terminal post of each section of fence.

182.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

186.1 DESCRIPTION

.1 This Item shall consist of the removal of all types of fencing.

186.2 MATERIALS

.1 None identified.

186.3 SUBMITTALS

.1 None identified.

186.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All post holes shall be backfilled and tamped and graded to match the surrounding grade.

.3 The dismantling and removal shall be carried out in a manner so as to avoid damage to the adjacent and surrounding area.

  .1 The Contractor shall be responsible, at his own expense, for any repair of such damage resulting from this Work.

.4 All materials and waste shall become the property of the Contractor and shall be disposed of outside the Work Site.

186.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of fencing dismantled and handled in accordance with this Item.

186.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

APPLICATION OF WATER **ITEM: 191**

191.1 DESCRIPTION

.1 This Item consists of the supply and application of water.

191.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Water shall be obtained from a source approved by the appropriate regulatory agency or agencies, and shall be free of any deleterious materials.

191.3 SUBMITTALS

.1 The Contractor shall submit, upon request, the method of withdrawal, the method of application of the water and the certification of the approval of the source.

191.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Water shall be applied by Equipment capable of a uniform and even rate of distribution in such amounts and at such times as required, for the following purposes:

  .1 For dust control, any time that the Contractor is hauling within the Work Site or public traffic is directed through the Work Site over dust-prone surfaces.

  .2 For compaction of soils or aggregates.

  .3 To cool a newly placed asphalt concrete mat.

.3 The Contractor shall be prepared to apply water on a seven-day-per-week basis.

191.5 MEASUREMENT FOR PAYMENT

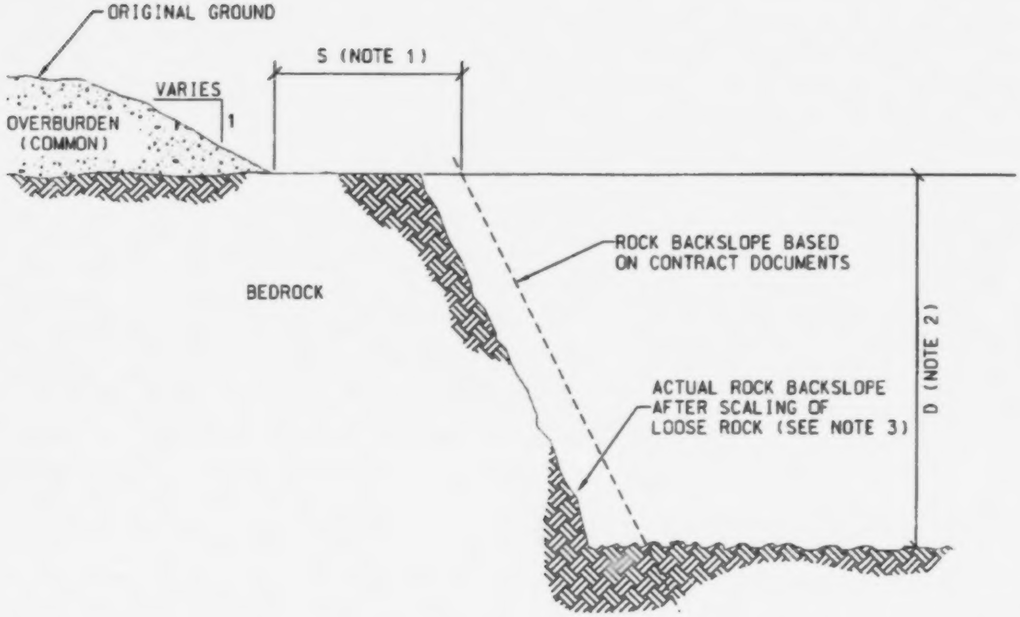
.1 The Quantity to be measured for payment shall be the number of cubic metres of water supplied and applied in accordance with this Item.

.2 The capacity (load size) of each water tank will be determined prior to the commencement of the Work, either by weighing each load or by weighing and/or calculating a typical load and counting the loads applied, thereafter.

  .1 For the purposes of this Item, a tonne (mass) shall be equivalent to a cubic metre.

191.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of water application, as identified under the Contract.

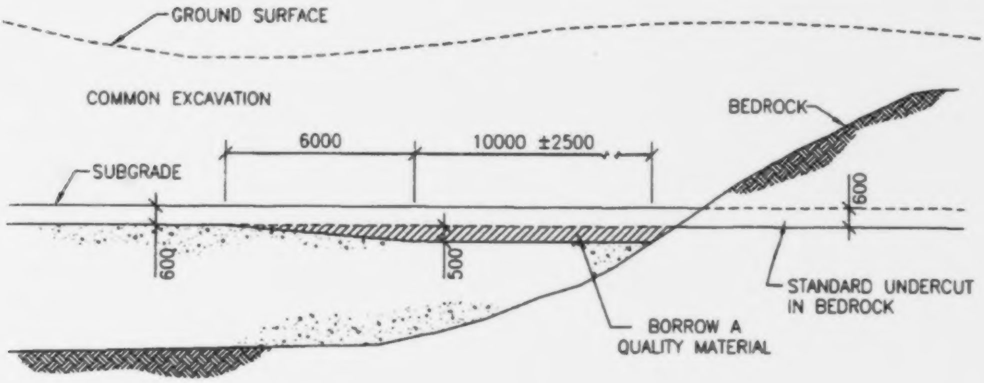

ORIGINAL GROUND
S (NOTE 1)
VARIES
1
OVERBURDEN
(COMMON)
ROCK BACKSLOPE BASED ON CONTRACT DOCUMENTS
BEDROCK
D (NOTE 2)
ACTUAL ROCK BACKSLOPE AFTER SCALING OF LOOSE ROCK (SEE NOTE 3)

NOTES:

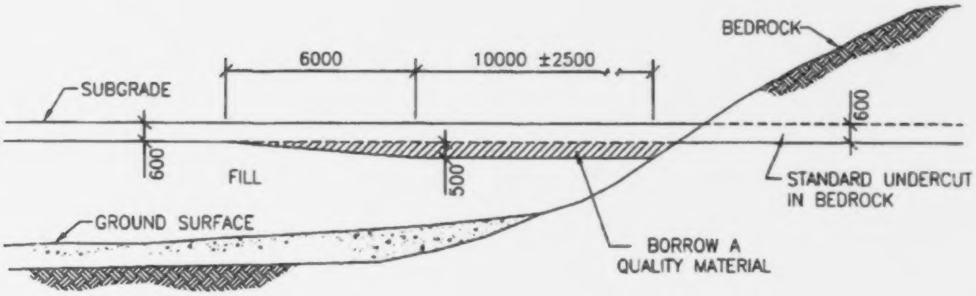
1. THE SLOPE SETBACK DISTANCE "S" SHALL BE 1.5 m OR AS DIRECTED BY THE ENGINEER.
2. THE EXCAVATED DEPTH "D" SHALL NOT EXCEED 3m BEFORE THE SHAPING OF THE OVERBURDEN SLOPE HAS BEEN COMPLETED.
3. SCALING OF LOOSE ROCK AND PREPARATION OF THE FINISHED BACKSLOPE INCLUDING ANY OVERBREAK SHALL BE SUBJECT TO THE APPROVAL OF THE ENGINEER.

File: 106-1

Shaping of Overburden at Top of Solid Rock Backslope

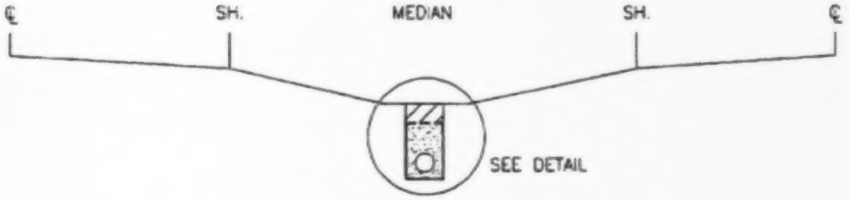

GROUND SURFACE
COMMON EXCAVATION
BEDROCK
6000
10000 ±2500
SUBGRADE
600
600
500
STANDARD UNDERCUT IN BEDROCK
BORROW A QUALITY MATERIAL

TRANSITION IN CUT CONDITION

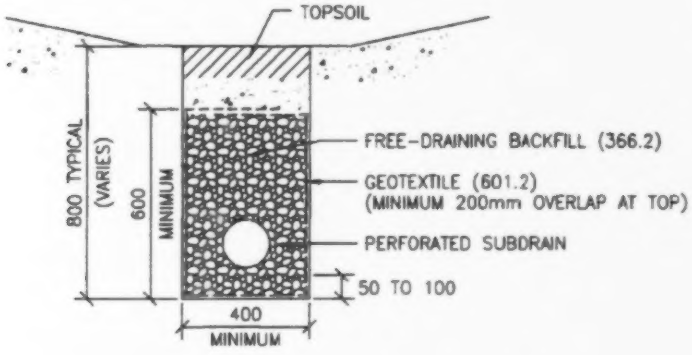

BEDROCK
6000
10000 ±2500
SUBGRADE
600
600
FILL
500
STANDARD UNDERCUT IN BEDROCK
GROUND SURFACE
BORROW A QUALITY MATERIAL

TRANSITION IN FILL CONDITION

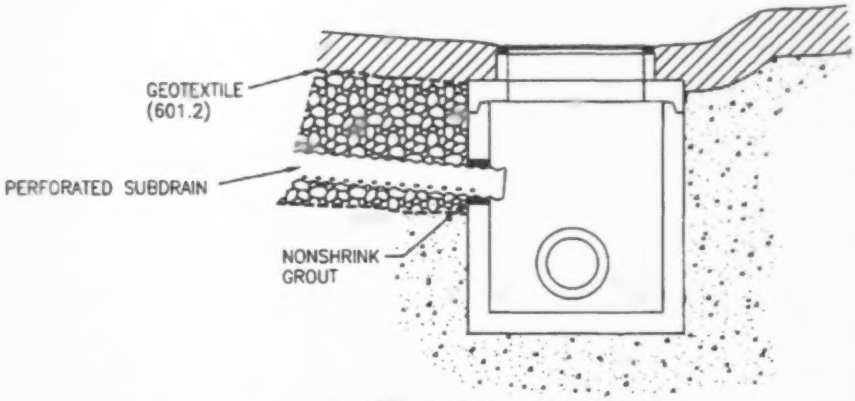
Solid Rock Transitions (longitudinal)


℄
SH.
MEDIAN
SH.
℄
SEE DETAIL

TYPICAL SECTION
MEDIAN SUBDRAIN INSTALLATION

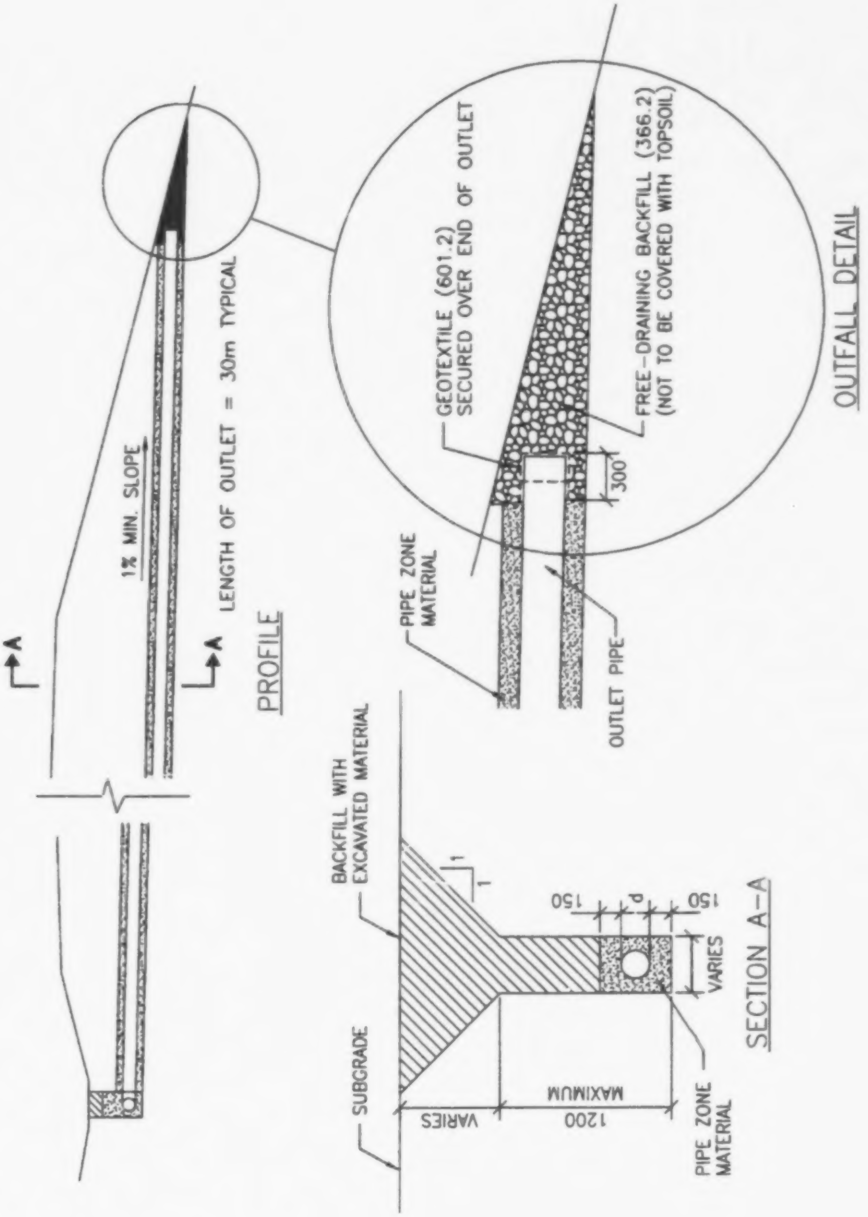

TOPSOIL
FREE-DRAINING BACKFILL (366.2)
GEOTEXTILE (601.2)
(MINIMUM 200mm OVERLAP AT TOP)
PERFORATED SUBDRAIN
50 TO 100
400
MINIMUM
800 TYPICAL
(VARIES)
600
MINIMUM

DETAIL


GEOTEXTILE
(601.2)
PERFORATED SUBDRAIN
NONSHRINK
GROUT

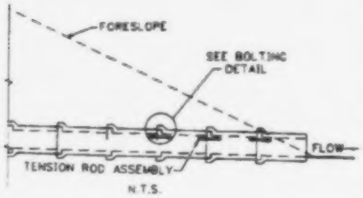
CATCH BASIN CONNECTION

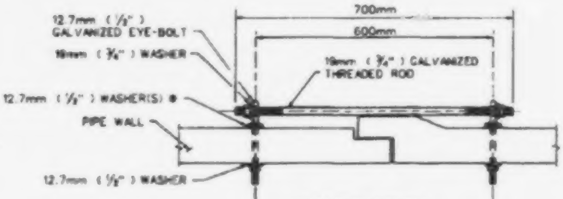
Subdrain


PROFILE
1% MIN. SLOPE
LENGTH OF OUTLET = 30m TYPICAL
A
A
OUTFALL DETAIL
GEOTEXTILE (601.2) SECURED OVER END OF OUTLET
FREE-DRAINING BACKFILL (366.2) (NOT TO BE COVERED WITH TOPSOIL)
300
PIPE ZONE MATERIAL
OUTLET PIPE
SECTION A–A
BACKFILL WITH EXCAVATED MATERIAL
1
1
150
d
150
VARIES
SUBGRADE
VARIES
1200 MAXIMUM
PIPE ZONE MATERIAL

Subdrain Outlet

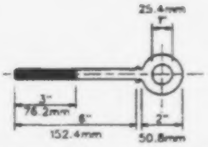
FILE: 137-1


FORESLOPE
SEE BOLTING DETAIL
FLOW
TENSION ROD ASSEMBLY
N.T.S.


700mm
600mm
12.7mm (½") GALVANIZED EYE-BOLT
19mm (¾") WASHER
19mm (¾") GALVANIZED THREADED ROD
12.7mm (½") WASHER(S) *
PIPE WALL
12.7mm (½") WASHER

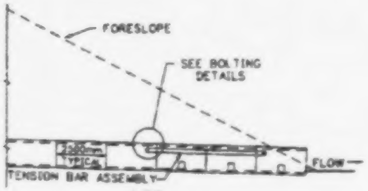
BOLTING DETAIL
N.T.S.

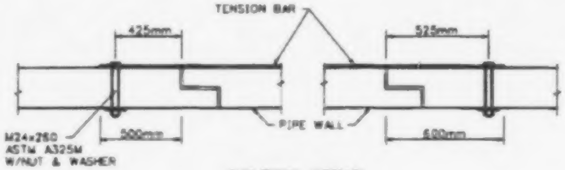
* NOTE: MINIMUM ONE WASHER REQUIRED, ADD EXTRA WASHERS TO CLEAR BELL.


25.4mm
1"
3"
76.2mm
6"
152.4mm
2"
50.8mm

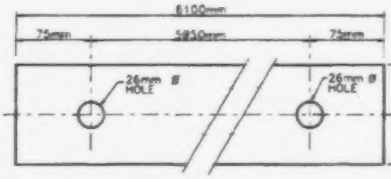
12.7mm (½") GALVANIZED
EYE-BOLT WITH SHOULDER
N.T.S.

TENSION ROD ASSEMBLY - RAISED BELLS

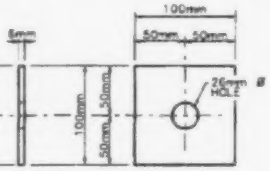

FORESLOPE
SEE BOLTING DETAILS
2500mm TYPICAL
FLOW
TENSION BAR ASSEMBLY
N.T.S.


TENSION BAR
425mm
525mm
M24x260 ASTM A325M W/NUT & WASHER
500mm
PIPE WALL
600mm

BOLTING DETAIL
N.T.S.

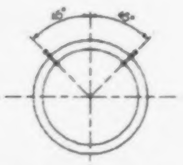

6100mm
75mm
5950mm
75mm
26mm Ø HOLE
26mm Ø HOLE

TENSION BAR
N.T.S.


6mm
100mm
50mm
50mm
100mm
50mm
50mm
26mm Ø HOLE

WASHER
N.T.S.

TENSION BAR ASSEMBLY - FLUSH BELLS



TENSION ROD / BAR
PLACEMENT DETAIL
N.T.S.

NOTES:

(1) TENSION RODS MAY BE SHORT , AS SHOWN (ONE PER JOINT) , OR LONG, TO SPAN THREE JOINTS AS TENSION BARS DO.

(2) STEEL SHALL BE PER CSA G40.12 300W.

(3) TENSION RODS / BARS, NUTS AND WASHERS SHALL BE GALVANIZED PER CSA G164-M92, TO A MINIMUM MASS OF 610g/m^2 .

(4) EYE-BOLTS FOR TENSION RODS SHALL BE GALVANIZED 12.7mm (1/2") SAE GRADE 5.

(5) BOLTS FOR TENSION RODS SHALL BE GALVANIZED M24x260 (SAE GRADE 5).

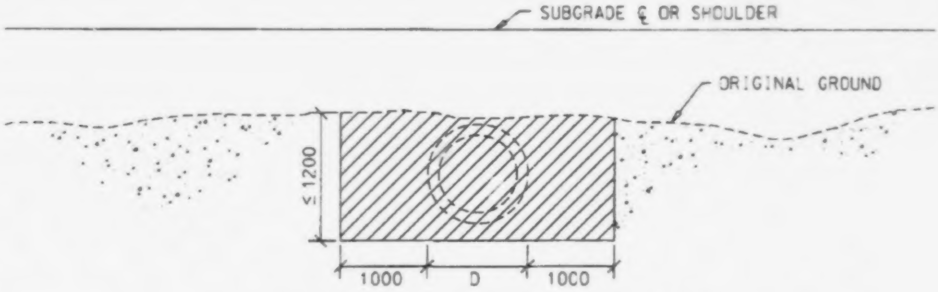
(6) TENSION BAR SHALL BE USED AS TEMPLATE FOR CONTRACTOR TO FIELD DRILL HOLES IN INSTALLED PIPE.

(7) NUTS SHALL NOT BE OVER TIGHTENED.

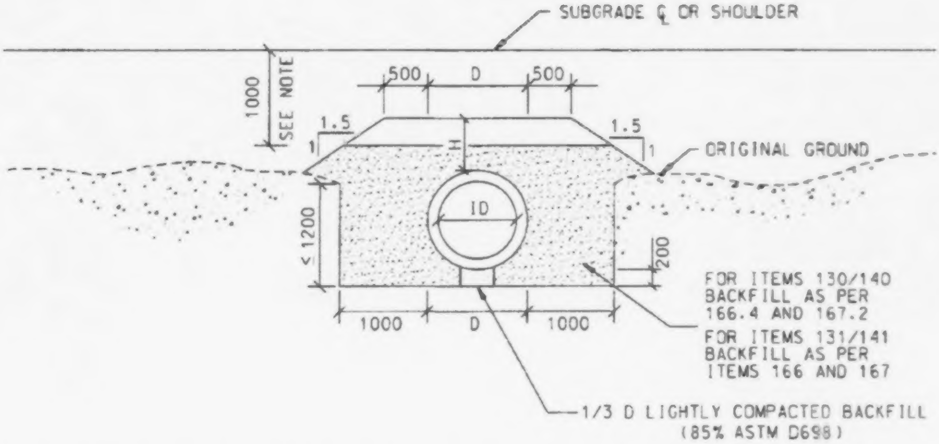
(8) BOLT LENGTH PROTRUDING MORE THAN 25mm BEYOND TIGHTENED NUT SHALL BE CUT OFF FLUSH WITH NUT.

File: 140-1

Tension Rod/Bar Assembly


SUBGRADE ℄ OR SHOULDER
ORIGINAL GROUND
≤ 1200
1000
D
1000

LIMITS OF FOUNDATION EXCAVATION


SUBGRADE ℄ OR SHOULDER
1000
SEE NOTE
500
D
500
1.5
1
1.5
1
H
ORIGINAL GROUND
ID
≤ 1200
200
1000
D
1000
FOR ITEMS 130/140 BACKFILL AS PER 166.4 AND 167.2
FOR ITEMS 131/141 BACKFILL AS PER ITEMS 166 AND 167
1/3 D LIGHTLY COMPACTED BACKFILL (85% ASTM D698)

LIMITS OF BACKFILLING AROUND STRUCTURES (TO HEIGHT "H")

NOTE:

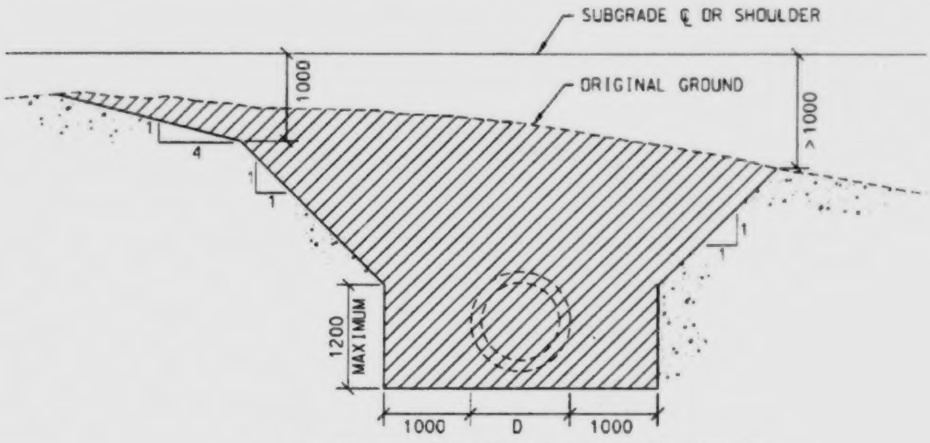
BACKFILL MATERIAL WITHIN 1000mm OF SUBGRADE SHALL BE THE SAME AS OR SIMILAR TO THAT WHICH COMPRISES THE ROADBED FILL.

D = NOMINAL PIPE DIAMETER: OUTSIDE DIAMETER OF CONCRETE PIPE, OR DIAMETER OF METAL PIPE, OR SPAN OF METAL PIPE-ARCH (ID = OD)

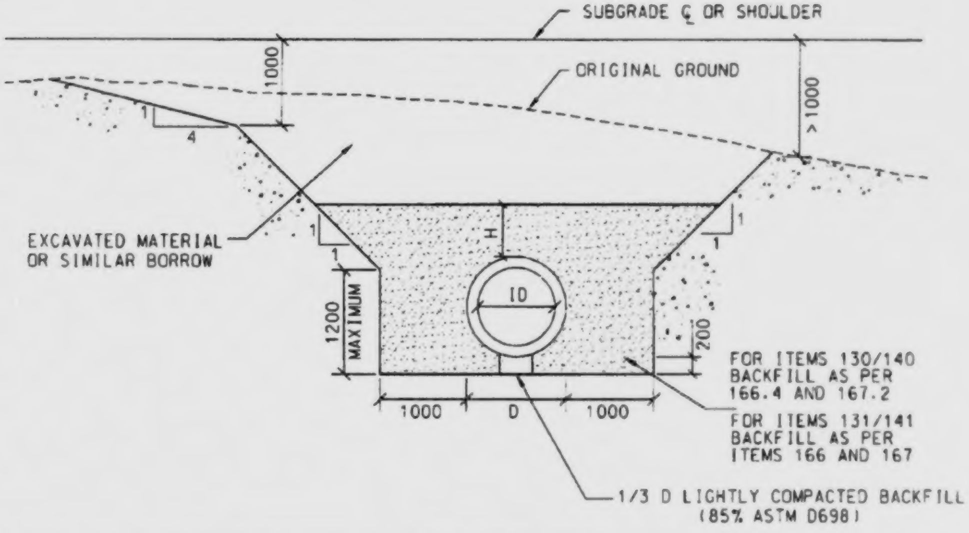
ID	H
≤ 1200	600
>1200 TO ≤2000	1000
> 2000	ID/2

Case 1.1
Cross Culvert : Subgrade Above Original Ground
Trench ≤ 1.2 m deep

File: 161-1


SUBGRADE ℄ OR SHOULDER
1000
ORIGINAL GROUND
> 1000
1
4
1
1
1
1
1200
MAXIMUM
1000
D
1000

LIMITS OF FOUNDATION EXCAVATION


SUBGRADE ℄ OR SHOULDER
1000
ORIGINAL GROUND
> 1000
1
4
EXCAVATED MATERIAL
OR SIMILAR BORROW
1
1
1
1
H
ID
1200
MAXIMUM
200
1000
D
1000
FOR ITEMS 130/140
BACKFILL AS PER
166.4 AND 167.2
FOR ITEMS 131/141
BACKFILL AS PER
ITEMS 166 AND 167
1/3 D LIGHTLY COMPACTED BACKFILL
(85% ASTM D698)

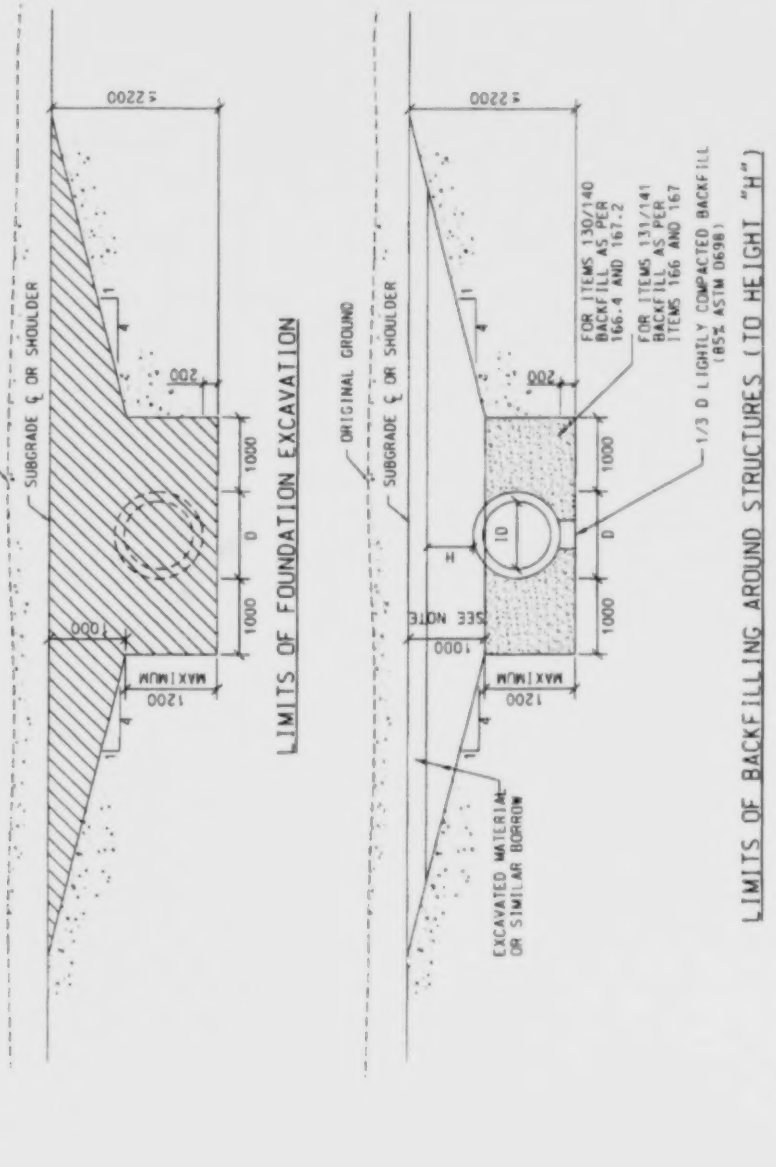
LIMITS OF BACKFILLING AROUND STRUCTURES (TO HEIGHT "H")

NOTE:
D = NOMINAL PIPE DIAMETER: OUTSIDE DIAMETER OF CONCRETE PIPE OR DIAMETER OF METAL PIPE, OR SPAN OF METAL PIPE-ARCH (ID = OD)

ID	H
≤1200	600
>1200 TO ≤2000	1000
>2000	ID/2

Case 1.2
Cross Culvert : Subgrade Above Original Ground
Trench > 1.2 m deep

File: 161-2


ORIGINAL GROUND
SUBGRADE ℄ OR SHOULDER
≤2200
200
1
4
1000
D
1000
1000
1200
MAXIMUM
ORIGINAL GROUND
SUBGRADE ℄ OR SHOULDER
≤2200
200
FOR ITEMS 130/140 BACKFILL AS PER 166.4 AND 167.2
FOR ITEMS 131/141 BACKFILL AS PER ITEMS 166 AND 167
1/3 D LIGHTLY COMPACTED BACKFILL (85% ASTM D698)
1000
D
1000
ID
H
SEE NOTE
1000
1200
MAXIMUM
EXCAVATED MATERIAL OR SIMILAR BORROW

LIMITS OF FOUNDATION EXCAVATION

LIMITS OF BACKFILLING AROUND STRUCTURES (TO HEIGHT "H")

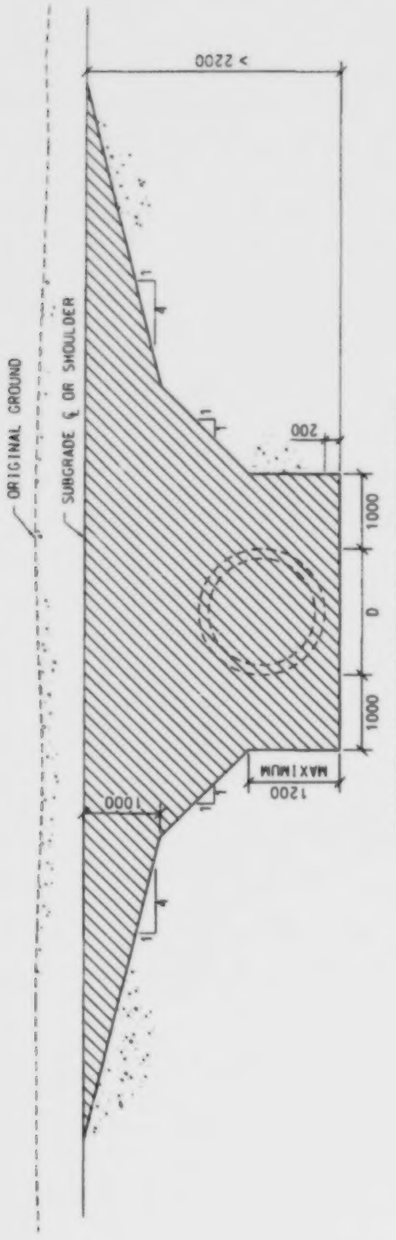
ID	H
≤1200	600

NOTE:

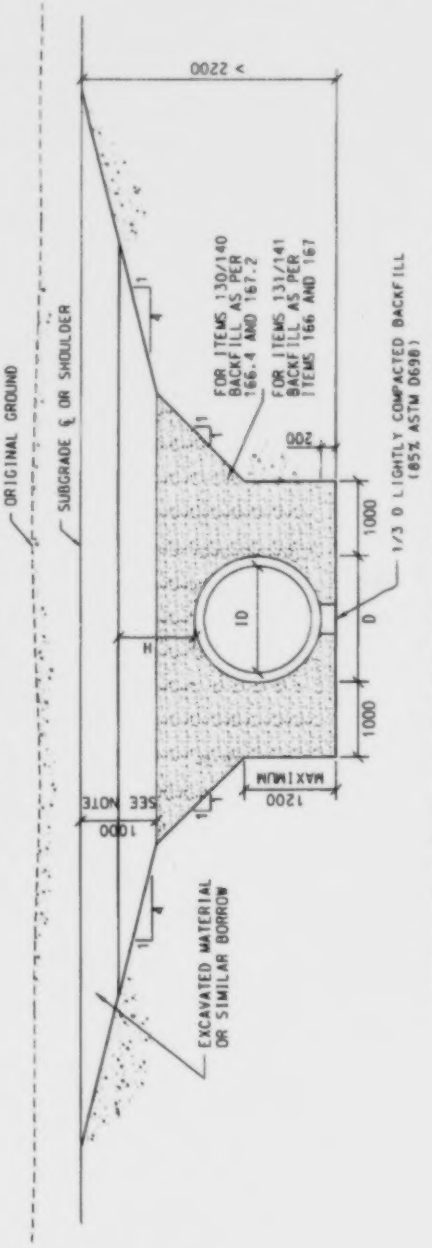
BACKFILL MATERIAL WITHIN 1000mm OF SUBGRADE SHALL BE THE SAME AS OR SIMILAR TO THAT WHICH COMPRISES THE ADJACENT SUBGRADE MATERIAL.

D = NOMINAL PIPE DIAMETER: OUTSIDE DIAMETER OF CONCRETE PIPE, OR DIAMETER OF METAL PIPE, OR SPAN OF METAL PIPE-ARCH (ID = OD)

Case 2.1
Cross Culvert : Original Ground Above Subgrade
Trench ≤ 2.2 m deep


ORIGINAL GROUND
SUBGRADE ℄ OR SHOULDER
> 2200
1
4
1
1
200
1000
D
1000
1200
MAXIMUM
1000
1
1
4

LIMITS OF FOUNDATION EXCAVATION


ORIGINAL GROUND
SUBGRADE ℄ OR SHOULDER
> 2200
1
4
1
FOR ITEMS 130/140 BACKFILL AS PER 166.4 AND 167.2
FOR ITEMS 131/141 BACKFILL AS PER ITEMS 166 AND 167
200
1000
D
1000
1/3 D LIGHTLY COMPACTED BACKFILL (85% ASTM D698)
ID
H
1200
MAXIMUM
SEE NOTE
1000
1
1
4
EXCAVATED MATERIAL OR SIMILAR BORROW

LIMITS OF BACKFILLING AROUND STRUCTURES (TO HEIGHT "H")

ID	H
≤ 1200	600
>1200 TO ≤ 2000	1000
> 2000	ID/2

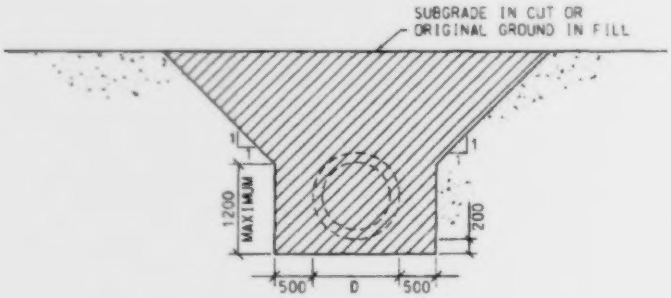
NOTE:

BACKFILL MATERIAL WITHIN 1000mm OF SUBGRADE SHALL BE THE SAME AS OR SIMILAR TO THAT WHICH COMPRISES THE SUBGRADE MATERIAL.

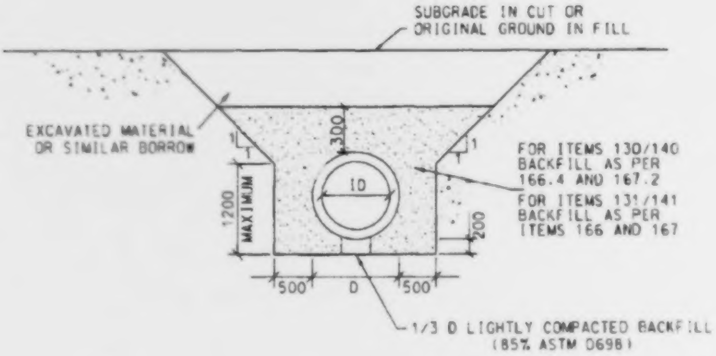
D = NOMINAL PIPE DIAMETER: OUTSIDE DIAMETER OF CONCRETE PIPE, OR DIAMETER OF METAL PIPE, OR SPAN OF METAL PIPE-ARCH (ID = DD)

Case 2.2
Cross Culvert : Original Ground Above Subgrade
Trench > 2.2 m deep

File: 161-4

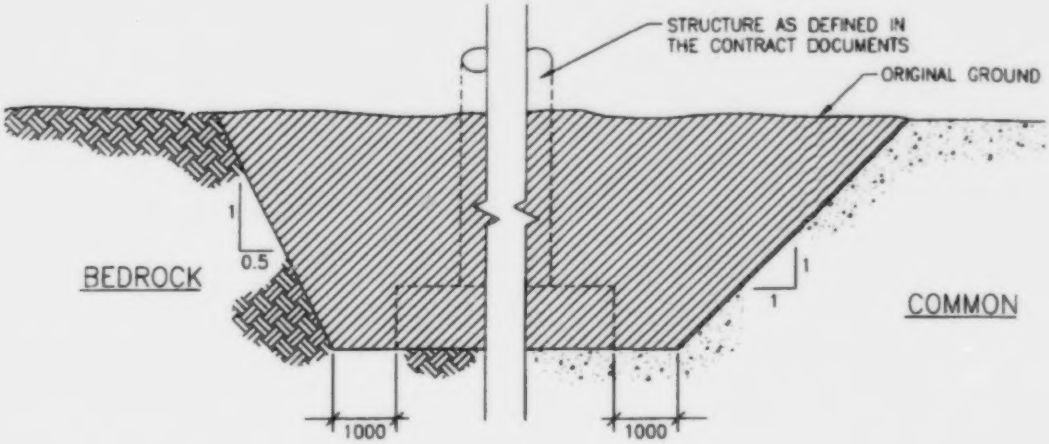

SUBGRADE IN CUT OR
ORIGINAL GROUND IN FILL
1
1
1
1
1200
MAXIMUM
200
500
D
500

LIMITS OF FOUNDATION EXCAVATION

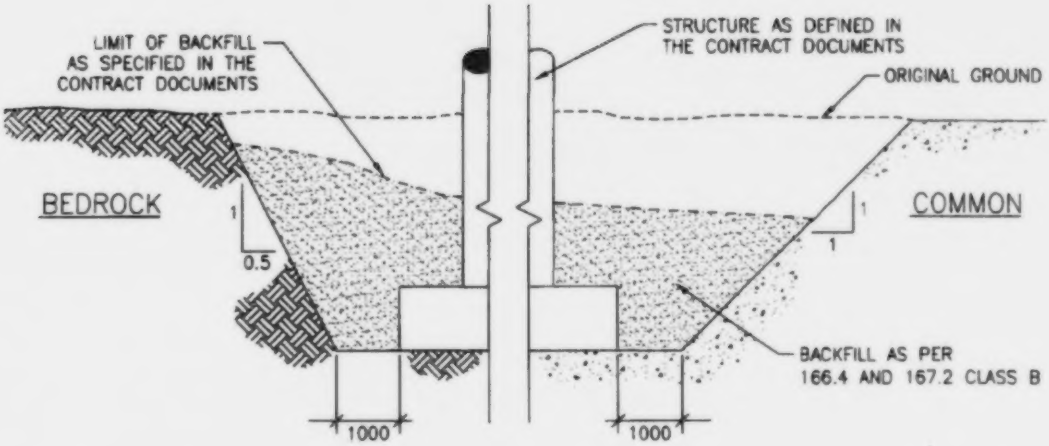

SUBGRADE IN CUT OR
ORIGINAL GROUND IN FILL
EXCAVATED MATERIAL
OR SIMILAR BORROW
300
1
1
1
1
ID
1200
MAXIMUM
200
FOR ITEMS 130/140
BACKFILL AS PER
166.4 AND 167.2
FOR ITEMS 131/141
BACKFILL AS PER
ITEMS 166 AND 167
500
D
500
1/3 D LIGHTLY COMPACTED BACKFILL
(85% ASTM D698)

LIMITS OF BACKFILLING AROUND STRUCTURES

Case 3.1
Storm Drainage Culvert Longitudinal to the Centreline of Roadway

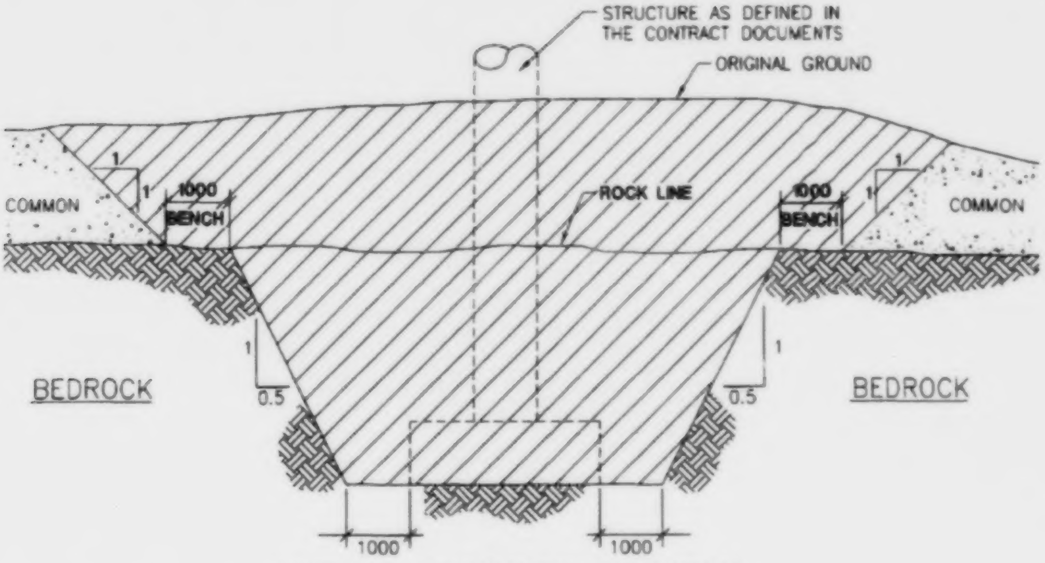

STRUCTURE AS DEFINED IN THE CONTRACT DOCUMENTS
ORIGINAL GROUND
1
0.5
BEDROCK
1
1
COMMON
1000
1000

LIMITS OF FOUNDATION EXCAVATION

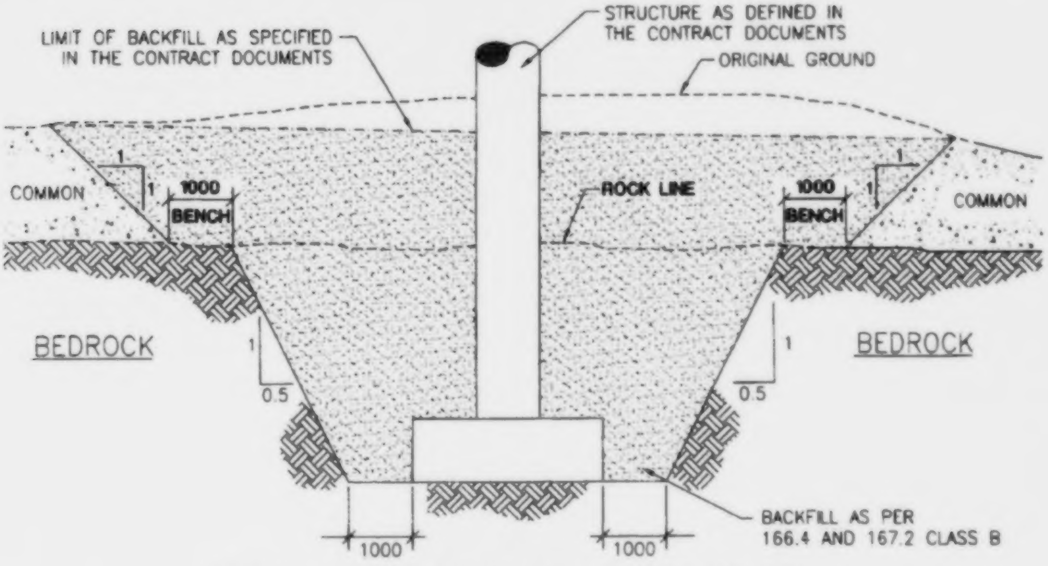

LIMIT OF BACKFILL AS SPECIFIED IN THE CONTRACT DOCUMENTS
STRUCTURE AS DEFINED IN THE CONTRACT DOCUMENTS
ORIGINAL GROUND
BEDROCK
1
0.5
1
1
COMMON
BACKFILL AS PER 166.4 AND 167.2 CLASS B
1000
1000

LIMITS OF BACKFILLING AROUND STRUCTURES

Foundation Excavation for Footings
Solid Rock and Common Cases


STRUCTURE AS DEFINED IN THE CONTRACT DOCUMENTS
ORIGINAL GROUND
COMMON
1
1
1000
BENCH
ROCK LINE
1000
BENCH
1
1
COMMON
BEDROCK
1
0.5
1
0.5
BEDROCK
1000
1000

LIMITS OF FOUNDATION EXCAVATION


LIMIT OF BACKFILL AS SPECIFIED IN THE CONTRACT DOCUMENTS
STRUCTURE AS DEFINED IN THE CONTRACT DOCUMENTS
ORIGINAL GROUND
COMMON
1
1
1000
BENCH
ROCK LINE
1000
BENCH
1
1
COMMON
BEDROCK
1
0.5
1
0.5
BEDROCK
BACKFILL AS PER 166.4 AND 167.2 CLASS B
1000
1000

LIMITS OF BACKFILLING AROUND STRUCTURES

Foundation Excavation for Footings
Common over Solid Rock Case

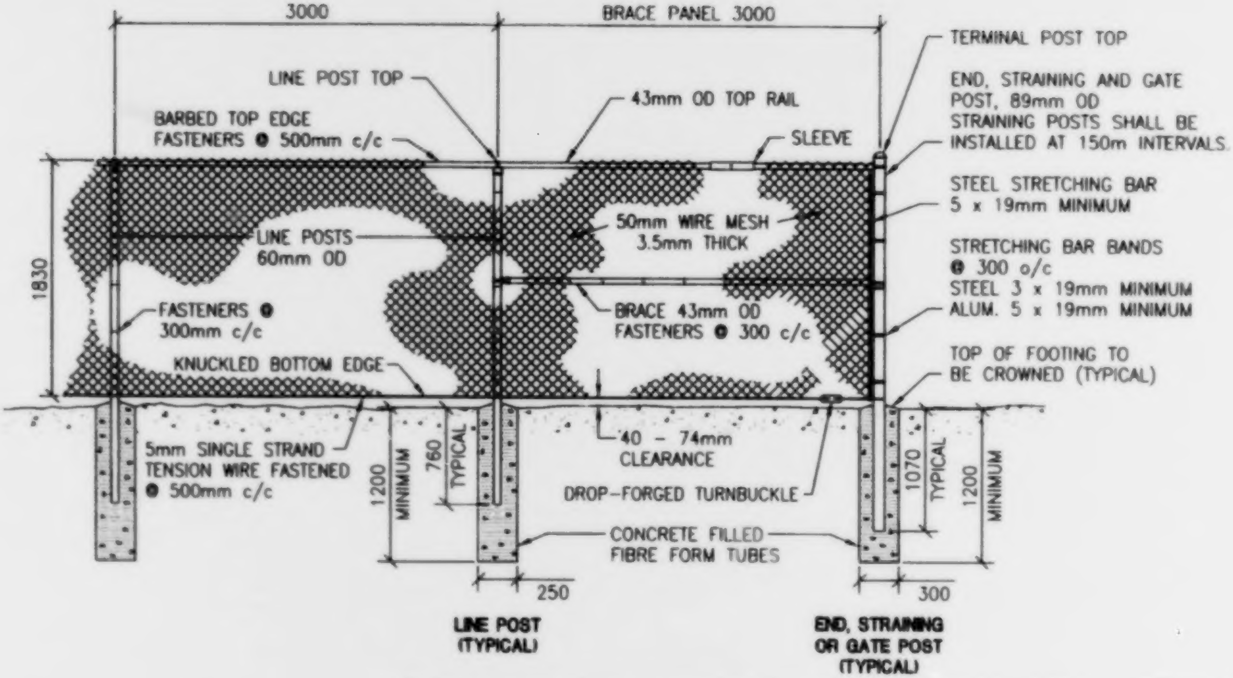
FILE: 182-1

New Brunswick Nouveau

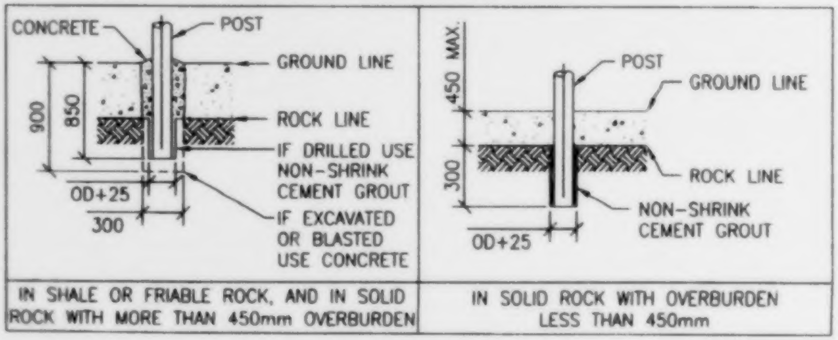
STANDARD SPECIFICATIONS
DEPARTMENT of TRANSPORTATION

STANDARD DRAWINGS

ITEM: 199


3000
BRACE PANEL 3000
TERMINAL POST TOP
LINE POST TOP
END, STRAINING AND GATE POST, 89mm OD
STRAINING POSTS SHALL BE INSTALLED AT 150m INTERVALS.
43mm OD TOP RAIL
BARBED TOP EDGE FASTENERS @ 500mm c/c
SLEEVE
STEEL STRETCHING BAR 5 x 19mm MINIMUM
LINE POSTS 60mm OD
50mm WIRE MESH 3.5mm THICK
STRETCHING BAR BANDS @ 300 o/c
STEEL 3 x 19mm MINIMUM
ALUM. 5 x 19mm MINIMUM
1830
FASTENERS @ 300mm c/c
BRACE 43mm OD FASTENERS @ 300 c/c
TOP OF FOOTING TO BE CROWNED (TYPICAL)
KNUCKLED BOTTOM EDGE
40 - 74mm CLEARANCE
5mm SINGLE STRAND TENSION WIRE FASTENED @ 500mm c/c
1200 MINIMUM
760 TYPICAL
DROP-FORGED TURNBUCKLE
1070 TYPICAL
1200 MINIMUM
CONCRETE FILLED FIBRE FORM TUBES
250
300
LINE POST (TYPICAL)
END, STRAINING OR GATE POST (TYPICAL)

FASTENERS SHALL BE MINIMUM 3.5mm ALUMINUM WIRE. FASTENING OF BOTTOM EDGE OF FENCE MAY BE DONE BY USING FASTENERS OR BY BENDING A KNUCKLED MESH WIRE AROUND THE TENSION WIRE.


CONCRETE
POST
GROUND LINE
900
850
ROCK LINE
IF DRILLED USE NON-SHRINK CEMENT GROUT
OD+25
300
IF EXCAVATED OR BLASTED USE CONCRETE
IN SHALE OR FRIABLE ROCK, AND IN SOLID ROCK WITH MORE THAN 450mm OVERBURDEN
450 MAX.
POST
GROUND LINE
300
ROCK LINE
NON-SHRINK CEMENT GROUT
OD+25
IN SOLID ROCK WITH OVERBURDEN LESS THAN 450mm

January, 2006

GRADING

Chain Link Fence

Standard Drawing 182-1

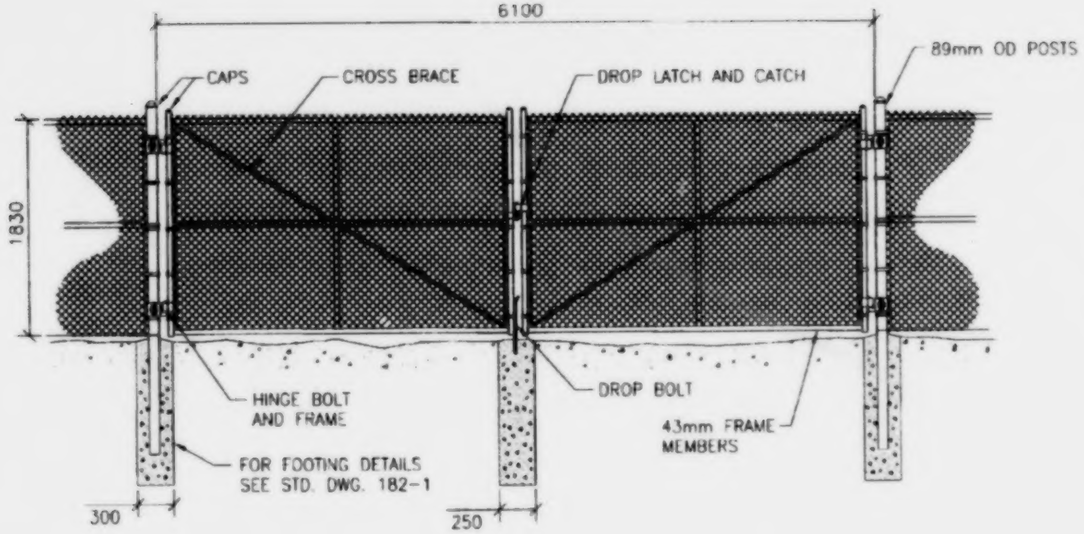
File: 182-2

STANDARD SPECIFICATIONS
DEPARTMENT of TRANSPORTATION

STANDARD DRAWINGS

New Brunswick Nouveau

ITEM: 199


6100
89mm OD POSTS
CAPS
CROSS BRACE
DROP LATCH AND CATCH
1830
HINGE BOLT AND FRAME
DROP BOLT
43mm FRAME MEMBERS
FOR FOOTING DETAILS SEE STD. DWG. 182-1
300
250

DOUBLE SWING GATE

Chain Link Gate

GRADING

January, 2006

Standard Drawing 182-2

DIVISION 200

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204	Shoulder Material	2
205	Fine Grading	1
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259	Bituminous Tack Coat	2
260	Asphalt Concrete	36
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PRODUCTION OF HIGHWAY AGGREGATES

ITEM: 201

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201.5 MEASUREMENT FOR PAYMENT 201-11

201.6 BASIS OF PAYMENT 201-11

201.1 DESCRIPTION

.1 This Item consists of the processing and stockpiling of Highway aggregates.

.2 For the purposes of this Item the term "rock" does not include sandstone, which is handled as a separate material.

201.2 MATERIALS

201.2 .1 General

.1 All materials shall be supplied by the Contractor.

.2 The Contractor shall provide the pit and/or quarry source for supply unless the source of the materials is specified in the Contract Documents.

.3 The Owner reserves the right to reject any source of supply of aggregates on the basis of past field performance, documented by the records and experience of the Owner and/or the Engineer with a specific material, regardless of compliance with physical requirements or grading limits.

.4 The Owner maintains records of field and Laboratory testing results for known Highway aggregate sources located throughout the province and these records are available for viewing, in accordance with Item 926, at the Owner's offices located in the Soils and Mineral Building, 975 College Hill Road, Fredericton, NB, during normal business hours.

201.2 .2 Rock And Gravel Aggregates - Physical Requirements

.1 Aggregate shall be composed of clean, hard, sound, durable, uncoated particles that do not contain friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate prone [illegible] decomposition or disintegration, or present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the Work.

.2 Aggregate shall meet the requirements of Table 201-1.

Table 201-1
Properties of Rock and Gravel Aggregate

Test and Method	Aggregate Type	Value (Max.)
Micro-Deval (MTO LS - 618)	Cover Material	22%
	Aggregate Base	25%
	Aggregate Subbase and Shoulder Material	30%
Micro-Deval (MTO LS - 619)	Blending Material (Aggregate Base)	25%
	Blending Material (Aggregate Subbase and Shoulder Material)	30%
Freeze Thaw (MTO LS - 614)	All Highway Aggregates	20%
Flat & Elongated Particles @ 4:1 (MTO LS - 608)	Crushed Rock Aggregates	35%
Plasticity Index (AASHTO T89 and T90)	Aggregate Base and Blending Material	3
	Aggregate Subbase and Blending Material	5

201.2 .3 Blending of Aggregates

.1 Blending of aggregates will be permitted to meet the grading requirements, increase the percentage of crushed particles, or decrease the percentage of flat and elongated particles.

.2 Blending will not be permitted if required solely to improve the results of material quality tests (Micro-Deval, Freeze-Thaw and Plasticity Index).

.3 Blending will be permitted only at the crusher, and the method and location of introducing the blending material into the crushing process shall be submitted in writing to the Engineer for approval, prior to production of any blended product.

.4 The blending material shall be added such that the rate of blending is controlled and measurable.

.5 Blending materials shall be granular materials having a Dust content not exceeding 20% when tested in accordance with ASTM C117.

  .1 The blending materials shall individually meet the Micro-Deval and Plasticity Index requirements of Table 201-1.

.6 Natural sand or gravel used as blending material in the production of the crushed rock aggregates shall not exceed 20% by mass of the blended aggregate produced.

.7 Blending of aggregates shall produce a consistently graded product.

201.2 .4 Aggregate Base/Subbase

201.2.4 .1 Crushed Rock Base/Subbase

.1 Crushed rock base/subbase shall be produced by the processing of rock to Conform to the grading limits as set out in Table 201-2, when tested in accordance with ASTM C136 and C117.

.1 Rock shall be quarried from a source that is solid in situ.

Table 201-2
Grading Limits - Crushed Rock Base/Subbase

ASTM Sieve Size	Aggregate Base		Aggregate Subbase	
	25 mm % passing	31.5 mm % passing	50 mm % passing	75 mm % passing
90.0 mm				100
75.0 mm				95 - 100
63.0 mm			100	85 - 100
50.0 mm			95 - 100	73 - 95
37.5 mm		100	76 - 100	58 - 87
31.5 mm	100	95 - 100		
25.0 mm	95 - 100	81 - 100	60 - 84	
19.0 mm	71 - 100	66 - 90	50 - 76	35 - 69
12.5 mm	56 - 82	50 - 77		
9.5 mm	47 - 74	41- 70	32 - 61	25 - 54
4.75 mm	31 - 59	27 - 54	21 - 49	17 - 43
2.36 mm	21 - 46	17 - 43	15 - 40	12 - 35
1.18 mm	13 - 34	11 - 32	10 - 32	8 - 28
300 µm	5 - 18	4 - 19	4 - 18	4 - 16
75 µm	0 - 8	0 - 8	0 - 9	0 - 9

201.2.4 .2 Crushed Gravel Base/Subbase

.1 Crushed gravel base/subbase shall be produced by the processing of gravel to Conform to the grading limits of Table 201-3 when tested in accordance with ASTM C136 and C117.

Table 201-3
Grading Limits - Crushed Gravel Base/Subbase

ASTM Sieve Size	Aggregate Base		Aggregate Subbase		
	25 mm % passing	31.5 mm % passing	50 mm % passing	75 mm % passing	100 mm % passing
100.0 mm					100
90.0 mm				100	95 - 100
75.0 mm				95 - 100	80 - 100
63.0 mm			100	86 - 100	
50.0 mm			95 - 100	75 - 95	60 - 87
37.5 mm		100	79 - 100	61 - 87	50 - 81
31.5 mm	100	95 - 100			
25.0 mm	95 - 100	83 - 100	63 - 85		
19.0 mm	75 - 100	70 - 90	53 - 78	38 - 70	34 - 68
12.5 mm	60 - 82	55 - 78			
9.5 mm	52 - 75	45 - 72	35 - 62	28 - 56	25 - 58
4.75 mm	36 - 61	30 - 57	24 - 51	19 - 46	17 - 48
2.36 mm	25 - 48	20 - 46	17 - 42	13 - 37	13 - 39
1.18 mm	16 - 36	14 - 35	12 - 33	9 - 30	9 - 30
300 µm	5 - 16	5 - 19	5 - 18	4 - 16	4 - 17
75 µm	0 - 6	0 - 6	0 - 6	0 - 7	0 - 7

201.2.4.2 .2 Gravel Base shall have a minimum of 40% of the particles, by mass, having at least one fractured face, when tested in accordance with ASTM D5821.

201.2.4 .3 Pit Run Gravel Subbase

.1 Pit run gravel subbase shall be gravel that Conforms to the grading limits set out in Table 201-4, when tested in accordance with ASTM C136 and C117.

  .1 Oversize rocks in the pit run material shall be removed from the Work.

Table 201-4
Grading Limits - Pit Run Gravel Subbase

ASTM Sieve Size	%-Passing
125 mm	100
100 mm	95 - 100
75 mm	82 - 100
50 mm	62 - 100
37.5 mm	52 - 100
19 mm	30 - 90
9.5 mm	22 - 79
4.75 mm	16 - 66
2.36 mm	12 - 55
1.18 mm	9 - 44
300 µm	4 - 25
75 µm	0 - 7

201.2.4 .4 Crushed Sandstone Subbase

.1 Crushed sandstone subbase shall be produced by the processing of sandstone to Conform to the grading limits as set out in Table 201-5, when tested in accordance with ASTM C136 and C117.

Table 201-5
Grading Limits - Crushed Sandstone Subbase

ASTM Sieve Size	50 mm % Passing	75 mm % Passing	100 mm % Passing
100 mm			95-100
75 mm		95 - 100	
50 mm	95 - 100		
75 µm	0 - 10	0 - 10	0 - 10

201.2.4.4.1 .1 Sandstone shall be composed of clean uncoated particles free from clay, organic or other deleterious materials, and shall be from a source that is solid in situ.

  .1 Sandstone rubble and highly weathered sandstone will not be acceptable.

.2 Sandstone shall have a Freeze-Thaw loss of not more than 70% when tested in accordance with MTO LS - 614.

201.2 .5 Shoulder Material

.1 Shoulder material shall be produced by the processing of rock or gravel to Conform to the grading limits set out in Table 201-6, when tested in accordance with ASTM C136 and C117.

Table 201-6
Grading Limits - Shoulder Material

ASTM Sieve Size	31.5 mm % passing
37.5 mm	100
31.5 mm	95 - 100
25.0 mm	84 - 100
19.0 mm	70 - 90
12.5 mm	55 - 78
9.5 mm	45- 72
4.75 mm	30 - 57
2.36 mm	20 - 46
1.18 mm	14 - 35
300 µm	7 - 21
75 µm	3 - 12

201.2 .6 Cover Material

.1 Cover materials shall be produced by the processing of rock or gravel to Conform to the grading limits set out in Table 201-7, when tested in accordance with ASTM C136 and C117.

Table 201-7
Grading Limits - Cover Material

ASTM Sieve Size	9.5 mm % passing	12.5 mm % passing	16 mm % passing	19 mm % passing
19.0 mm				100
16.0 mm			100	
12.5 mm		100	0 - 90	40 - 80
9.5 mm	100	40 - 90	0 - 60	20 - 62
4.75 mm	0 - 5	0 - 20	0 - 20	0 - 20
2.36 mm		0 - 8	0 - 8	0 - 10
75 µm	0 - 2	0 - 3	0 - 3	0 - 3

201.3 SUBMITTALS

.1 The Contractor shall notify the Engineer, in writing, identifying the source of material.

  .1 The Contractor shall make available all Equipment necessary for the Engineer to obtain representative samples of the material proposed for supply.

  .2 The Engineer shall require up to 21 Days from the date of sampling to the date of notification of the evaluation of the material.

.2 The Contractor shall not commence any processing Work until written notification of the approval of the source is received from the Engineer.

201.4 CONSTRUCTION

201.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall advise the Engineer immediately of any changes in the source materials, at any time during the course of the Work.

  .1 Random samples shall be taken and tests conducted by the Engineer to determine the effects of the change.

  .2 No Work shall be undertaken by the Contractor in the area of the changed conditions until an approval is received from the Engineer.

.3 For rock and gravel aggregates, if samples taken during the Work fail to meet the physical property requirements of Table 201-1, the Contractor shall cease production and make necessary changes in location or source to produce material meeting the requirements.

201.4 .2 Plant

.1 The Contractor shall provide an area for the Owner's lab trailer and shall make all necessary provisions for power and an adequate supply of water (minimum 10 L/min) that is clean and free of injurious amounts of oil, alkali, acid, organic matter or other deleterious substances, for the duration of the Work.

  .1 The Contractor shall retain a qualified electrician to perform the electrical hook-up to Conform to the requirements of the Canadian Electrical Code.

.2 The Contractor shall provide the Engineer safe access to the stream of crushed aggregate flowing off the belt(s), or to the stockpile.

.3 The Contractor shall crush and screen aggregates with Equipment of adequate capacity and capable of yielding a consistent and acceptable product.

201.4.2 .4 Aggregates shall only be washed by a method that produces a consistent product.

.1 The water to be used for washing aggregate shall be clean and free of injurious amounts of oil, alkali, acid, organic matter or other deleterious substances.

.2 Disposal of any washing residue shall be the responsibility of the Contractor.

201.4 .3 Pits and Quarries Controlled By Owner

.1 Processed materials not meeting the specified aggregate type and/or size shall remain the property of the Owner.

.2 The Contractor shall be responsible for the loading, hauling and stockpiling of this material at a location within the developed pit/quarry as specified in the Contract Documents. and/or as directed by the Engineer.

201.4 .4 Pits and Quarries Controlled by Others

.1 Processed materials not meeting the specified aggregate type and/or size shall be the responsibility of the Contractor.

201.4 .5 Stockpiles

.1 Crushed aggregate shall be stockpiled at a location as indicated in the Contract Documents and/or as approved by the Engineer.

.2 Stockpiling of aggregate shall be done on well-drained, level base(s) capable of supporting the entire weight and dimension of the stockpile(s) and in such a manner as to ensure maximum recovery of the stockpiled material(s).

.1 Stockpiles shall not be placed near the quarry face, Stripping piles or piles of other aggregates, nor near property lines, tree lines or drainage ditches such that retrieval of all aggregate is not possible or practical and access to the stockpile shall be maintained at all times.

.2 If a potential for contamination of the aggregate exists due to ground conditions at the stockpile site, the Contractor shall evenly distribute and compact a layer of clean, fine-grained material, a minimum of 150 mm thick, to form a foundation for the stockpiles.

.3 Stockpiles shall be built in layers not exceeding one metre in depth and each layer shall be completed before the next layer is begun.

.4 Forming of cone-shaped piles with conveyer belts, pushing up piles with a tractor and dumping over the edge of stockpiles will not be permitted.

.5 It is the express responsibility of the Contractor to ensure that stockpiles contain material of the specified quality and gradation and are of uniform distribution.

.1 Aggregates that become contaminated or mixed with other aggregates or segregated shall be immediately removed from the stockpile(s).

201.4 .6 Sampling and Testing of Aggregates

.1 The crushed product will be monitored for gradation throughout the period of the Work and will be accepted or rejected on the basis of the tests performed by the Engineer.

.2 Sampling and testing shall be carried out as indicated in Table 201-8.

Table 201-8
Minimum Sampling And Testing Frequency

Procedure	Standard(s)	Minimum Frequency Per Shift	
		≤ 50 mm	≥ 75 mm
Sampling Aggregates	ASTM D75	3	2
Reduction of Sample	ASTM C702	3	2
Sieve Analysis	ASTM C117, C136	3	2

NOTE 1: Shift is defined as one production crew's daily work period.

NOTE 2: Where production is greater than 4000 t per shift the minimum frequency of testing will be increased as determined by the Engineer.

NOTE 3: Frequency of testing may also be reduced during low production, as determined by the Engineer.

201.4.6 .3 Sample sizes smaller than those specified in ASTM D75 and C136 may be used for quality control purposes, as indicated in Table 201-9

Table 201-9
Minimum Sieve Analysis Sample Sizes

Aggregate			Cover Material	
Type	Size mm	Mass g	Size mm	Mass g
Base	25	5000	9.5	1000
Base/Shoulder Material	31.5	7000	12.5	1200
Subbase	50	10000	16	1500
Subbase	75	15000	19	2000
Subbase	100	20000		
Subbase	Pit Run	20000		

NOTE: Field samples obtained under ASTM D75 shall be at least four times larger than the above sieve analysis sizes.

201.4.6 .4 The Contractor shall be provided a copy of all test results as soon as they are available and shall be notified immediately if any test result indicates that materials are being produced outside of the specified limits.

201.4 .7 Aggregates Produced Outside the Specified Limits

.1 The Contractor shall not place any material into the production stockpile after notification under 201.4.6.4 that the material being produced is outside the specified limits.

.2 The Contractor shall "hold" the placement of material into the production stockpile or shall stockpile all material being produced in separate and clearly defined "reject" stockpile(s) once a test result indicates that the material being produced does not meet specification and shall continue to do so until such time that 2 additional consecutive sieve analyses show that material being produced is within the specified limits.

 .1 Should only one test indicate material to be outside the specified limits then following the completion of 2 acceptable consecutive test results, the material held may be placed in the production stockpile; otherwise the held material and any other production shall be rejected from the Work until 2 acceptable consecutive test results are obtained.

.3 The sequence of material acceptance /rejection into production stockpiles is indicated in Table 201-10.

Table 201-10
Schematic Representation of Handling Procedure

two consecutive tests within Specifications		place in production stockpile
one test outside Specifications	hold in separate stockpile(s)	
	next two tests within specification	place in production stockpile
one test outside Specifications	hold in separate stockpile(s)	
	following test outside Specification	reject material
		reject until two consecutive tests within specification

201.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of aggregate processed and stockpiled, in accordance with this Item.

201.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size and type of aggregate, as identified under the Contract.

203.1 DESCRIPTION

.1 This Item consists of supply and placement of Aggregate Base/Subbase.

203.2 MATERIALS

203.2 .1 General

.1 All materials shall be supplied by the Contractor.

.2 Aggregate Base/Subbase shall conform to the requirements of 201.2, 201.3 and 201.4, and shall be of the type and size, as indicated in the Contract Documents.

203.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

203.4 CONSTRUCTION

203.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Aggregate Base/Subbase materials shall conform to the properties and specified gradation requirements for the class of material specified, at the time of incorporation into the Work, and up to the completion of the Contract.

.1 If the material incorporated into the Work does not conform with the specified properties and/or gradation, the Contractor shall cease hauling from the source of supply and shall immediately rectify the problem to the satisfaction of the Engineer.

.2 Any material found to be non-conforming to the specified material shall be removed from the Work.

.3 The Contractor shall advise the Engineer of any changes in the source materials, at any time during the course of the Work and sufficiently in advance so that random samples may be taken and tests conducted by the Owner to determine the effects of the change.

.1 No Work shall be undertaken by the Contractor in the area of the changed conditions until an approval is received from the Engineer.

203.4 .2 Placement

.1 The Contractor shall satisfy himself that the existing grade has been constructed to the lines and grades as indicated in the Contract Documents prior to the commencement of the Work.

  .1 Any deficiencies in grade shall be noted and submitted in writing prior to the commencement of the Work.

.2 Aggregate Base/Subbase materials shall not be placed on inundated, soft, muddy, potholed rutted or frozen surfaces and Work will progress only once the Work Area has been approved by the Engineer.

  .1 Any ruts or potholes which appear in advance of the Aggregate placement shall be eliminated by scarifying, shaping and compacting, or if necessary, by excavating the unsuitable material and placing and compacting new material of the same quality.

.3 Prior to the placement of Aggregate Base/Subbase, the slopes and ditches in the Work Area(s) shall have been shaped to the satisfaction of the Engineer, including any topsoil that may be required.

.4 The Aggregate Base/Subbase shall be spread evenly and compacted in lifts minimizing the potential for segregation.

  .1 The maximum Aggregate Subbase lift thickness shall be 300 mm.

.5 Each lift of Aggregate Base/Subbase shall be bladed, shaped and compacted to produce the required Profile and cross section.

.6 The final grade after shaping and compaction, shall be to the specified tolerances.

.7 Spreading, shaping and compacting operations shall proceed simultaneously with the dumping operations and the Contractor shall, at the completion of any Day, ensure that all material placed is shaped and compacted to the specified density.

.8 Crawler tractors and scrapers shall not be permitted for hauling or placing of Aggregate Base/Subbase.

.9 The Foreslope in the Aggregate Base/Subbase layers shall be constructed to be free of ruts, ridges and/or undulations, to form a straight line Slope in cross section.

.10 Aggregate Base/Subbase materials shall not be bladed onto the Subgrade Foreslope.

.11 Any deterioration of the placement grade which appears during the course of the Work and is directly or indirectly attributable to the Contractor shall be repaired to the satisfaction of the Engineer before any Work may continue over this area.

.12 The Contractor shall remove, from the Work Site, excess material and oversize stones which have been bladed to the sides of the layer.

.13 The Contractor shall maintain the finished grade to the specified tolerances and to the specified density until the completion of the Contract.

203.4.2 .14 The Engineer may accept the Work on contiguous 1 km long sections of Roadbed or the whole length of Roadbed depending on conditions at the time of the Work.

203.4 .3 Segregation

.1 If the Contractor's methods result in segregation of the materials, as defined by ASTM C125 and tested in accordance with ASTM C136, the Contractor shall cease Work immediately.

.2 If segregation of materials occurs, then the Contractor shall submit a Work plan to scarify and make good the Work in place, or shall remove the segregated materials from the Work.

203.4 .4 Compaction

.1 The material shall be compacted in accordance with Item 936 to a minimum of 95% of the maximum dry density.

203.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of Aggregate Base/Subbase supplied and placed, in accordance with this Item.

203.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size and type of Aggregate Base/Subbase, as identified under the Contract.

.2 Haulage for Aggregate Base/Subbase, as approved by the Engineer, will be paid for in accordance with Item 801.

204.1 DESCRIPTION

.1 This Item consists of supply and placement of Shoulder materials on the Roadbed Shoulder.

204.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Shoulder material shall conform to the requirements of 201.2, 201.3 and 201.4 and shall be of the type and size, as indicated in the Contract Documents.

.3 If specified for use in the Contract, RAP shall be made available by the Owner.

  .1 RAP may be made available under Item 208 and/or from a stockpile location, as identified in the Contract Documents.

  .2 The Contractor shall be responsible to supply the material to the Work.

  .3 The Contractor shall process the RAP to contain 100% passing the 50.0 mm sieve size, as determined by ASTM C136, and shall be free of all lumps or clods and soil.

204.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

204.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The placement of Shoulder material shall be carried out in a manner so as to avoid damage to the adjacent and surrounding Roadbed.

  .1 The Contractor shall be responsible, at his own expense, to repair any damage to the adjacent and/or abutting finished surfaces resulting from this Work.

.3 Shoulder material shall be placed by Equipment specifically designed for that purpose.

  .1 Any Shoulder spreader considered for the Work shall be constructed so that it will not place any Shoulder material on the Pavement.

  .2 Shoulder material shall not be bladed onto the Subgrade Foreslope.

204.4 .4 The Contractor shall spread the Shoulder material evenly in lifts not exceeding 150 mm uncompacted thickness and shall employ methods to limit segregation.

.1 Where surplus Aggregate Base has been windrowed along the Shoulder during the Work under Item 205, the Contractor shall spread, shape and compact the windrowed material on the Shoulder at his own expense, prior to placing any shoulder material under this Item.

.5 The Shoulder material shall be compacted in accordance with Item 936 to a minimum of 95% of the maximum dry density, except as follows:

.1 RAP shall be compacted to the maximum density as determined by a test strip.

.6 The Contractor shall not permit more than 4 km of each lift of newly laid asphalt concrete to be open to traffic without the Shoulder material operation being in progress.

.1 Regardless of the distance paved, each new lift of newly laid asphalt concrete shall not be open to traffic for a period greater than 7 Days without Shoulder material being placed.

.2 Where the difference in elevation between the asphalt concrete and the Shoulder exceeds 70 mm in any portion of the Work, the Shoulder material placement operation shall commence within 48 hours of the placement of the asphalt concrete.

.7 Shoulder material shall be placed in driveways and around guide posts as directed by the Engineer.

.1 The Contractor shall undertake all handwork that may be necessary to complete the Work.

.8 Final shaping of the Shoulder material shall be consistent and continuous to the grade of the abutting Pavement surface and shall extend at the specified Slope to the line of the Foreslope and shall be blended and shaped to match the Foreslope intersection.

.9 The Contractor shall keep clean the adjacent Pavement surface and in all cases the Pavement surface shall be free of Shoulder material prior to opening the Work Area to traffic.

204.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of Shoulder material supplied and placed in accordance with this Item.

204.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size and type of Shoulder material, as identified under the Contract.

.2 The Contractor shall be subject to a penalty of $500.00 per Day, for each occurrence, if the Shoulder material placement operation is not carried out in the prescribed period as defined in 204.4.6.

205.1 DESCRIPTION

.1 This Item consists of shaping and compaction of Aggregate Base to the specified lines and grades.

205.2 MATERIALS

.1 None required.

205.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

205.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All fine grading shall be carried out in accordance with Item 941 and/or to grades, slopes, dimensions and tolerances as directed by the Engineer.

  .1 If at any time during the Work, the Work becomes rutted or displaced, the Contractor shall make all necessary repairs to reinstate the surface grade and if necessary, the depth rutted and/or displaced shall be scarified, reshaped and compacted to meet the requirements of this Item.

.3 The fine grading material shall be compacted in accordance with Item 936 to a minimum of 95% of the maximum dry density.

.4 On paving Contracts, materials remaining from fine grading operations shall be used to the extent possible to complete the shouldering to the line and grade of the finished Pavement.

  .1 If surplus material still remains after completion of shouldering then these materials shall remain the property of the Owner and shall be removed from the Work Site as directed by the Engineer.

  .2 The Contractor shall be responsible to ensure that all Shoulders and Foreslopes are left in a neat and uniform appearance.

205.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of fine grading completed in accordance with this Item.

.2 The area to be fine graded shall be defined as 300 mm beyond the edge of the Pavement line unless otherwise noted in the Contract Documents.

205.6 BASIS OF PAYMENT

.1 Payment for this Work shall be at the Unit Price.

208.1 DESCRIPTION

.1 This Item consists of the removal, haulage and stockpiling of asphalt concrete from a Roadbed.

208.2 MATERIALS

.1 None identified.

208.3 SUBMITTALS

.1 The Contractor shall notify the Engineer a minimum of 3 Days in advance of the commencement of the Work.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

208.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall take care in full depth removal not to contaminate the RAP with the underlying aggregate material.

.3 The Contractor shall provide, in partial depth removal, Equipment with automatic controls for the control of longitudinal grade and transverse Slope.

  .1 All loose material remaining after cold milling shall be swept to a granular shoulder or picked up from paved Shoulders, gutters, or from under guide rail before reopening the Work Area to traffic.

  .2 If a transverse vertical cut is milled in the existing Pavement at the limit of the Work Area the Contractor shall immediately construct with hot mixed asphalt concrete a temporary smooth 1.5 m long taper, as shown in Standard Drawing 260-1.

  .3 The Lanes shall be completed to the same location at the end of the day's cold milling.

.4 The Contractor shall remove all asphalt concrete from the faces of gutters, catch basins or manhole frames and other Structures abutting the Work, in such a manner that the Structures are not damaged, and the area after removal matches the grade of the adjacent removal area.

.5 The Contractor shall provide for the drainage of water from the cold milled area as determined by the Engineer.

208.4 .6 The RAP shall remain the property of the Owner and shall be loaded and hauled to a stockpile site as indicated in the Contract Documents or as directed by the Engineer.

.1 If the Contractor removes the specified thickness in more than one layer, then material from each layer must be stockpiled separately, unless otherwise indicated in the Contract Documents.

.7 Proper stockpiling procedures shall be used and care taken not to contaminate or consolidate the reclaimed asphalt concrete stockpile.

.1 If a potential for contamination of the RAP exists due to ground conditions at the stockpile site a layer of clean, fine-grained material shall be evenly distributed as a base for the stockpiles.

.2 The height of RAP stockpiles shall be a maximum of 3 m to limit the consolidation of the stockpiled material and no loaders, crawler tractors, trucks or other Equipment shall be permitted to travel on the stockpile.

.8 If the Contract Documents specify that the reclaimed asphalt concrete is to be used in a hot recycled asphalt mix, the RAP shall be weighed prior to placement in the stockpile.

.9 The Contractor shall continuously maintain the Work Site free of potholes and standing water and in a condition providing for the safe and efficient flow of traffic, from the time of removal, until such time as the new asphalt concrete is placed.

.1 Hot mixed asphalt concrete shall be placed in the potholes; cold mix or RAP are acceptable only as a temporary repair.

208.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of asphalt concrete acceptably removed, hauled and stockpiled in accordance with this Item.

208.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for either full depth or partial depth removal, as identified under the Contract.

231.1 DESCRIPTION

.1 This Item consists of the supply and installation of Shoulder subdrain and associated drain outlet Structures.

231.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Subdrain pipe shall be 100 mm diameter corrugated slotted plastic pipe, and shall meet the following:

  .1 PVC pipe and appurtenances shall be DR 35 conforming to CAN/CSA B182.2 and perforated as per CAN/CSA B182.1 (Clause 4.1.5), or

  .2 corrugated polyethylene pipe and appurtenances conforming to ASTM F667.

  .3 All subdrain pipe shall be pre-wrapped with a geotextile covering.

.3 All outlet pipe shall be solid corrugated plastic pipe and shall conform to the requirements of CAN/CSA B182.1.

.4 All appurtenances shall conform to the requirements of CAN/CSA B182.1.

.5 Geotextile shall be Type N2 in accordance with 601.2.

.6 Free draining backfill shall be supplied in accordance to the requirements of 366.2.

231.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

231.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall install the Shoulder subdrain system before paving.

.3 The subdrain trench shall be installed in the Shoulder of the Roadbed parallel to the edge of the Pavement and shall be carried out in a manner, so as to avoid damage to the adjacent and surrounding Roadbed.

  .1 The Contractor shall be responsible, at his own expense, to repair any damage to the adjacent and/or abutting finished surfaces resulting from this Work.

.4 The subdrain shall be installed in accordance with the Standard Drawing 231-1.

231.4 .5 The subdrain shall be installed as a continuous line with all joints being constructed with couplings compatible with the pipe supplied and in accordance with the manufacturer's recommendations.

.6 The ends of each continuous line of subdrain shall be capped.

.7 Subdrain outlets:

  .1 All subdrain outlets shall be installed in accordance with the Standard Drawing 231-1.

  .2 The Contractor shall install T-sections and the outlet Structures to the subdrain line at a maximum of 300 m intervals along the run of the line and at the lowest point along sag vertical curves and as directed by the Engineer.

  .3 The subdrain outlets shall be installed as a continuous line from the T-section union to the outfall.

  .4 The trench for the subdrain outlet shall be excavated from the T-section at the subdrain to the limit of the Foreslope.

  .5 The outfall end of the subdrain outlet shall be protected in accordance with the Standard Drawing 231-1.

  .6 All corrugated pipe used for subdrain outlet construction shall be unslotted and shall be graded to provide for positive gravity drainage from the subdrain to the outlet outfall.

  .7 All outfall detail backfill shall be graded to match the surrounding Foreslope grade.

  .8 The material excavated from the outlet trench shall be used for backfill of the subdrain outlet trench.

    .1 The trench backfill shall be placed in accordance with Item 936 and compacted to a minimum of 95% of the maximum dry density.

    .2 The trench shall be backfilled to match the surrounding grade.

.8 The material excavated from the subdrain trench shall be disposed of on the Shoulder of the Roadbed and shall be uniformly graded across the width of the Shoulder prior to the placement of shouldering material.

  .1 If the excavated material is deemed, by the Engineer, to be waste then the excavated material shall become the property of the Contractor and shall be disposed of outside the Work Site.

.9 All subdrain trench backfill shall be free-draining backfill and shall be placed in two equal layers and each layer shall be thoroughly tamped.

231.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the linear metres of Shoulder subdrain and the linear metres of subdrain outlets supplied and installed in accordance with this Item.

.2 The Shoulder subdrain shall be measured along the centreline of the pipe from end cap to end cap for each continuous section of installation.

.3 The outlet Structures shall be measured separately as a unit complete from the T-section to the finished Foreslope grade.

231.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

BITUMINOUS TACK COAT ITEM: 259

259.1 DESCRIPTION

.1 This Item consists of supply and application of a bituminous tack coat on an asphalt concrete or Portland cement concrete surface.

259.2 MATERIALS

.1 All material shall be supplied by the Contractor.

.2 Tack coat shall be SS-1 or CSS-1 Grade asphalt emulsion and shall conform in all respects to the provisions of CAN/CGSB 16.2, Table 1.

259.3 SUBMITTALS

.1 The Contractor shall notify the Engineer at least 3 Days in advance of the application of bituminous tack coat.

.2 The Contractor shall submit, upon request, the manufacturer's certification that the materials supplied meet the specified requirements as detailed in the Contract Documents.

259.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Bituminous pressure distributors shall be capable of applying tack within ±5% of established application rates, and at a continuous and uniform rate both longitudinally and transversely.

.3 Distributors shall be equipped with a tank gauge and measuring stick graduated in litres, and a sampling valve.

.4 The Contractor may place the bituminous tack coat by brushing or spraying at longitudinal and transverse joint locations.

.5 Bituminous tack coat shall be applied only when the surface to be treated is dry, and swept clean over the full width of surfaces to be treated.

.6 The Contractor shall protect through traffic and adjacent Highway/Structure appurtenances from any bituminous tack coat overspray.

  .1 The Contractor shall be responsible to remove any bitumen adhering to these surfaces.

.7 The SS-1 or CSS-1 emulsion shall be diluted with an equal amount of water and applied in a uniform manner, without streaking, at a rate of 0.20 to 0.30 L/m^2 or as directed by the Engineer.

259.4 .8 Temperature of the bituminous tack coat when applied shall be between 38 °C and 66 °C.

.9 Bituminous tack coat shall be allowed to cure for such a time as approved by the Engineer and traffic shall be diverted around freshly sprayed surfaces until the bituminous tack coat has set.

.10 Bituminous tack coat application widths shall be such that approximately one-half the Pavement width is left open to traffic with no tack coat applied.

  .1 Bituminous tack coat applications shall be strictly limited in length, to minimize inconvenience to the public and shall be kept within the asphalt concrete placing Work Area.

  .2 The Work shall be planned so that tacked surfaces will be covered with asphalt concrete, within 200 m of its length, when the Work Area is opened to traffic and at the end of the Day's Work.

  .3 The Contractor shall be responsible to reinstate any bituminous tack-coated surface which becomes fouled due to weather and/or traffic.

259.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of bituminous tack coat supplied and applied in accordance with this Item.

259.6 BASIS OF PAYMENT

.1 Payment for this Work shall be at the Unit Price.

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260.6 BASIS OF PAYMENT 260-35

260.1 DESCRIPTION

.1 This Item consists of the supply and placement of hot mixed conventional asphalt concrete and recycled asphalt concrete.

.2 The asphalt concrete shall be identified by the following mix designations:

.1 Hot mixed conventional asphalt concrete base mix - B

.2 Hot mixed conventional asphalt concrete base/surface mix - C

.3 Hot mixed conventional asphalt concrete surface mix - D

.4 Hot mixed recycled asphalt concrete base mix - HRB

260.2 MATERIALS

260.2 .1 Material Properties

260.2.1 .1 Asphalt Binder

.1 Asphalt binder shall be supplied by the Contractor.

.2 The asphalt binder grade shall be as specified in the Contract Documents.

.3 Performance Grade (PG) asphalt binder shall meet the requirements of AASHTO M320, Table 1 - Performance Graded Asphalt Binder Specification.

.4 When anti-stripping admixtures are required, then the asphalt binder grade shall meet the specified requirements of 260.2.1.1.3, after the addition of the required admixtures.

.5 The Contractor shall provide one sample of asphalt binder per 5000 t of asphalt concrete mix production, taken in accordance with ASTM D140 from the Contractor's asphalt binder storage tank (s).

.1 If the tendered Quantity of asphalt concrete exceeds 1000 t the Contractor shall provide a minimum of one binder sample.

.2 The sample containers and labels shall be supplied by the Engineer.

.3 Sampling shall be on a random basis, as determined by and in the presence of the Engineer.

260.2.1 .2 Coarse Aggregate

.1 Coarse aggregate shall be supplied by the Contractor.

.2 The coarse aggregate shall be prepared by crushing rock or gravel and shall consist of hard, sound, durable particles, free from adherent coatings, shale, clay, loam, schist and other soft or disintegrated pieces, or other deleterious substances.

260.2.1.2 .3 Coarse aggregate is the portion retained on the 4.75 mm sieve, tested in accordance with ASTM C136, and shall meet the physical requirements of Table 260-1.

Table 260-1
Physical Requirements for Coarse Aggregates

Design ESALs (Million, Based on 20 yrs)	Crushed Particles DOT Method (Min % by wt., one face/two faces)	Flat & Elongated Particles DOT Method (Max % @4:1)	Micro-Deval MTO LS 618 (Max % Loss)	Freeze-Thaw DOT Method (Max % Loss)	Absorption ASTM C127 (Max% by Mass Retained)
0.3 to < 3	Base (60) Surface (70)	Base (25.0) Surface (20.0)	Base (20.0) Surface (16.0)	Base (16.0) Surface (14.0)	Base (2.00) Surface (1.75)
3 to < 30	Base & Surface (95/80)	Base (20.0) Surface (15.0)	Base (18.0) Surface (15.0)	Base (14.0) Surface (12.0)	Base (2.00) Surface (1.75)
≥ 30	Base & Surface (95/80)	Base (20.0) Surface (15.0)	Base (18.0) Surface (15.0)	Base (14.0) Surface (12.0)	Base (2.00) Surface (1.75)

260.2.1.2 .4 For ≥ 3 million Design ESALs, coarse aggregate may be produced from pit run gravel by crushing the fraction retained on the 31.5 mm sieve, provided that no more than 10% of the retained material passes the 31.5 mm sieve, as determined by ASTM C136 and C117.

.5 Coarse aggregate may also be accepted or rejected on the basis of past performance and Petrographic Number.

.1 The maximum Petrographic Number shall be as follows:

- For 0.3 to < 3 million Design ESALs, 250 for Base and 200 for Surface;
- For ≥ 3 million Design ESALs, 230 for Base and 180 for Surface.

260.2.1 .3 Fine Aggregate

.1 Fine aggregate shall be supplied by the Contractor.

.2 Fine aggregate shall be prepared by crushing rock or gravel or screening a manufactured sand and shall consist of hard, sound, durable particles free from adherent coatings, shale, clay, loam, schist and other soft or disintegrated pieces, or other deleterious substances.

.3 Fine aggregate shall be the portion passing the 4.75 mm sieve, when tested in accordance with ASTM C117 and C136, and shall meet the physical requirements in Table 260-2.

Table 260-2
Physical Requirements for Fine Aggregates

Design ESALs (Million, Based on 20 yrs)	Micro-Deval MTO LS619 (Max. % Loss)	Uncompacted Void Content of Fine Aggregate ASTM C1252 (% Min.)
0.3 to < 3	Base (22.0) Surface (18.0)	45.0
3 to < 30	Base (20.0) Surface (16.0)	45.0
≥ 30	Base (20.0) Surface (16.0)	45.0

260.2.1.3 .4 For ≥ 3 million Design ESALs, fine aggregate may be produced from pit run gravel by crushing the fraction retained on the 6.3 mm sieve, provided that no more than 5% of the retained material passes the 31.5 mm sieve, as determined by ASTM C136 and C117.

.1 Material produced as per 260.2.1.2.4 and passing the 4.75 mm sieve may be used as fine aggregate.

.5 Fine aggregate may also be accepted or rejected on the basis of past performance.

260.2.1 .4 RAP

.1 If applicable to the Contract:

.1 RAP shall be supplied by the Owner in designated stockpiles and/or obtained by the Contractor under Item 208.

.2 The Contractor shall be responsible for incorporation of RAP into the asphalt concrete mix.

.3 RAP shall be free of contamination and shall be processed within 14 Days of the introduction into the cold feed at the plant, in such a manner that all particles pass the 50 mm sieve.

260.2.1 .5 Blending Sand

.1 Blending sand shall be supplied by the Contractor.

.2 Blending sand shall be used to obtain acceptable physical asphalt concrete mix properties as outlined in Table 260-7 and the source shall be approved by the Engineer before the material is incorporated into the asphalt concrete mix.

260.2.1.5 .3 The maximum mass of blending sand to be used in the total asphalt concrete mix shall not exceed 10% of the total mass.

.4 The grading tolerances for blending sand shall be as set out in Table 260-3.

Table 260-3
Maximum Grading Tolerances by Sieve Range

Sieve Range	Blending Sand
Passing the 25.0 mm to 150 μm sieves	± 10.0%
Passing the 75 μm sieve	± 5.0%

260.2.1 .6 Anti-stripping Admixtures

.1 Anti-stripping admixtures shall be supplied by the Contractor.

.1 The requirement for an anti-stripping admixture is determined at the asphalt concrete mix design stage.

.2 The Engineer has approved the anti-stripping admixtures listed in Table 260-4 for use in the Work.

Table 260-4
Approved Anti-stripping Admixtures

Product
Redicote 82-S Redicote C 3082
AD-here LOF 65-00
Pave Bond T Lite
Travcor 4505

260.2.1.6 .2 The type and dosage of all asphalt binder anti-stripping admixtures shall be noted on the delivery slip.

260.2 .2 Production of Aggregates and RAP

260.2.2 .1 Grading Requirements

.1 Pit run gravel or quarried rock shall be crushed and separated into coarse and fine aggregates.

260.2.2.1 .2 The gradation of coarse aggregate, fine aggregate, RAP and blending sand for each type of asphalt concrete mix shall meet the pegged limits as shown in Table 260-5, when tested in accordance with ASTM C117 and C136.

.1 The fine aggregate used in surface mixes may be allowed an extra one percent passing the 75μm sieve at the discretion of the Engineer.

.1 A request by the Contractor shall be submitted in writing to the Engineer.

Table 260-5
Pegged Grading Limits of Aggregates (by Mix Type)

ASTM Sieve Size	Coarse Aggregate % passing	RAP % passing	Blending Sand % passing	Fine Aggregate % passing	
				B, HRB mixes	C, D mixes
50.0 mm		100.0 for HRB			
25.0 mm	100.0 for B/HRB				
19.0 mm	max. 94.0 for B/HRB				
16.0 mm	100.0 for C				
12.5 mm	100.0 for D max. 96.0 for C				
9.5 mm			100.0	100.0	100.0
4.75 mm	max. 15.0			min. 80.0	min. 80.0
75 μm	max. 2.5			max. 9.0	max. 7.0

260.2.2 .2 Average Grading

.1 After the Contractor starts crushing, an average grading will be determined and tolerances will be applied to subsequent production.

.2 The average grading will be determined by averaging at least six washed sieve results, conducted in accordance with ASTM C117 and C136, on a minimum of 1500 t or 30% of the required amount.

.3 The average grading tolerances for crushed aggregates shall be as set out in Table 260-6.

Table 260-6
Maximum Average Grading Tolerances by Sieve Range

Sieve Range	Crushed Aggregates
Passing the 25.0 mm to 150 μm sieves	± 6.0%
Passing the 75 μm sieve	± 2.0%

260.2.2.2 .4 Irrespective of the tolerance values indicated in Table 260-6, all gradations are to be within the pegged limits indicated in Table 260-5.

.5 If the Contractor is unable to maintain production within the average grading tolerances, a new stockpile may be designated, requiring the determination of a new average grading which may require a new mix design.

260.2.2 .3 Washed Aggregates

.1 Washed materials or materials excavated from underwater shall be stored for at least 24 hours to allow free water to drain from the aggregate and to allow the material to attain a uniform moisture content.

260.2.2 .4 Blending Aggregates

.1 Blending of aggregates will be allowed only to meet the grading requirements and/or to increase the percentage of crushed particles.

.2 Blending shall be performed at the asphalt plant cold feed units to produce a consistently graded product.

260.2 .3 Composition of Asphalt Concrete Mix

260.2.3 .1 Asphalt Binder Content

.1 For the purpose of establishing the Unit Price for asphalt concrete the Bidder shall assume an asphalt binder content for the asphalt concrete mix as follows:

  .1 Asphalt concrete "B" : 5.0% of the total specified tonnage.

  .2 Asphalt concrete "C" : 5.7% of the total specified tonnage.

  .3 Asphalt concrete "D" : 6.0 % of the total specified tonnage.

  .4 Asphalt concrete "HRB" : 2.7% of the total specified tonnage.

260.2.3 .2 Mix Design

.1 The Engineer shall designate the composition of the mix.

  .1 The amount of RAP in a hot mixed recycled asphalt concrete mix shall be as specified in the Contract Documents.

.2 The Design Mix Formula (DMF) is the Laboratory determination of the precise proportions of asphalt binder and aggregates to be blended together to meet the requirements in Table 260-7.

  .1 The asphalt concrete mix design shall follow the Asphalt Institute Manual Series SP-2, Superpave Mix Design. Laboratory compaction of each test specimen will be accomplished by means of a gyratory compactor.

Table 260-7
Physical Requirements for Superpave Asphalt Concrete Mix

Design ESALS (Million-Based on 20 yrs)	% Air Voids	% Voids in Mineral Aggregate (VMA)	% Voids Filled with Asphalt (VFA)	% Moisture Sensitivity (Stripping) TSR ASTM D4867	Dust to Binder Ratio Range
0.3 to < 3	Min. (3.0) Max. (5.0)	B/HRB-Min. (13.0) C-Min. (14.0) D-Min (15.0)	Min. (70.0) Max. (80.0)	Min. (75)	0.6-1.2
3 to < 30	Min. (3.0) Max. (5.0)	B/HRB-Min. (13.0) C-Min. (14.0) D-Min. (15.0)	HRB/B/C-Min. (65.0) HRB/B/C-Max.(75.0) D-Min.(70.0) D-Max.(77.0)	Min. (75)	0.6-1.2
≥ 30	Min. (3.0) Max. (5.0)	B/HRB-Min. (13.0) C-Min. (14.0) D-Min. (15.0)	HRB/B/C-Min. (65.0) HRB/B/C-Max.(75.0) D-Min.(70.0) D-Max.(77.0)	Min. (75)	0.6-1.2

260.2.3.2 .3 The Job Mix Formula (JMF) establishes the single definite percentage for the 4.75 mm and 75 μm sieve fractions of the aggregate and for the asphalt binder, that will produce the desired asphalt concrete mix properties under field conditions.

  .1 The JMF is established by producing one or more trial asphalt concrete mixes using the plant proposed for the Work.

.4 The Design Asphalt Binder Content is the asphalt binder content established by the DMF.

.5 The Approved Asphalt Binder Content is the asphalt binder content determined by the JMF.

.6 The Actual Asphalt Binder Content is the asphalt binder content in the asphalt concrete mix as determined by storage tank measurements.

260.2.3 .3 Aggregate Requirements

.1 Sampling for DMF shall not be undertaken until:

  .1 At least 50% of each aggregate type, for the current years production, is produced and in stockpile.

.2 The Contractor shall be responsible for locating a suitable source of blending sand and arranging for the Engineer to take samples.

.3 The Contractor shall be responsible to deliver all samples obtained for testing to the DOT Laboratory, indicated by the Engineer, during normal working hours.

.4 The Contractor shall be notified by the Engineer in writing of the DMF no later than 14 Days after the aggregate stockpiles have been sampled and a suitable source of blending sand and/or the RAP samples have been delivered to the DOT Laboratory.

260.2.3.3 .5 The aggregates, including any required blending sand and/or RAP, shall be combined in such proportions as to provide an asphalt concrete mix conforming to the grading requirements of Table 260-8.

Table 260-8
Grading Limits of Combined Aggregates

ASTM Sieve size	**B / HRB** **% passing**	**C** **% passing**	**D** **% passing**
25.0 mm	100.0		
19.0 mm	84.0-98.0		
16.0 mm	72.0-94.0	100.0	
12.5 mm	60.0-87.0	88.0-98.0	100.0
9.5 mm	51.0-75.0	68.0-90.0	76.0-98.0
6.3 mm	41.0-66.0	54.0-77.0	60.0-84.0
4.75 mm	34.0-60.0	46.0-69.0	52.0-77.0
2.36 mm	22.0-50.0	28.0-58.0	36.0-65.0
1.18 mm	12.0-42.0	20.0-50.0	25.0-55.0
600 μm	6.0-32.0	13.0-40.0	16.0-44.0
300 μm	3.0-20.0	7.0-27.0	8.0-26.0
150 μm	2.0-8.0	3.0-10.0	4.0-12.0
75 μm	2.0-6.0 (B) 2.0-6.5(HRB)	2.0-6.0	2.0-6.0

260.3 SUBMITTALS

.1 The Contractor shall submit, in writing, the proposed source(s) of supply of coarse aggregate and fine aggregate for approval by the Engineer.

  .1 The Contractor shall arrange for the Engineer to take samples of the proposed sources.

  .2 The Contractor shall be responsible to deliver all samples obtained for testing to the DOT Fredericton, NB Laboratory during normal working hours.

.2 The Contractor shall notify the Engineer, 3 Days in advance of the commencement of the crushing operation and the production of the asphalt concrete mix.

.3 The Contractor shall notify the Engineer when stockpiles of coarse and fine aggregate and/or RAP are available for sampling for a mix design.

260.3 .4 The Contractor shall submit in writing, the proposed supplier of the asphalt binder.

.1 The Contractor shall supply, upon request, a sample of the asphalt binder (2 L/mix) and a sample of any proposed admixture(s), in a volume proportional to the asphalt binder sample.

.2 The Contractor shall supply, upon request, the optimum mixing and compaction temperature, for PG asphalt binders.

.3 The Contractor shall submit at the time of delivery to the plant the refinery certification and delivery slip for each tanker load of asphalt binder.

.4 If the source of supply of the asphalt binder changes during the Work, the Contractor shall submit in writing, this proposed change prior to using the new asphalt binder supply in the Work.

.5 The Contractor shall notify the Engineer a minimum of 3 Days in advance of when the plant is ready for calibration.

.6 Other submittals are required for this Item and are contained within the sections applicable to the specific phase of the Work being undertaken.

.7 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

260.4 CONSTRUCTION

260.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

260.4 .2 Equipment

260.4.2 .1 General

.1 Equipment shall be on site and available for inspection, testing and approval before paving operations start.

.2 The Contractor shall provide safe access to the plant and Equipment for purposes pertaining to the Work.

260.4.2 .2 Field Laboratory

.1 The Contractor shall provide an area for the Owner's lab trailer adjacent to the plant with vehicle access, power and an adequate supply of water (minimum 10 L/min) that is clean and free of injurious amounts of oil, alkali, acid, organic matter or other deleterious substances, for the duration of the Work.

.1 The Contractor shall retain a qualified electrician to perform the electrical hook-up to Conform to the requirements of the Canadian Electrical Code.

260.4.2 .3 Mixing Plant

.1 The asphalt mixing plant and its components shall meet the requirements of ASTM D995 and the Contract Documents.

260.4.2 .4 Asphalt Binder Storage

.1 Tanks for storage of asphalt binder shall be capable of heating the material and maintaining it within the range of ± 25°C from the optimum mixing temperature based on the temperature recommended by the asphalt binder supplier.

.2 Heating shall be by a means such that no flame shall contact the asphalt binder.

.3 Tanks shall be installed level and in such a manner that an accurate determination of quantities can be made at any time.

.1 The tank calibration charts shall be available to the Engineer at the plant at all times.

260.4.2 .5 Cold Bins

.1 Cold bins shall be divided into not less than three compartments; each equipped with individual gate control to enable accurate and absolute proportioning of each size of cold aggregate.

.2 Compartment dimensions shall be such as to promote free flow of material with a minimum gate opening of 50 mm.

.3 An individual compartment shall be provided for each aggregate type (i.e. coarse, fine, RAP) and intermingling of aggregates shall not be permitted.

260.4.2 .6 Thermometric Equipment

.1 An armoured thermometer reading from 90°C to 200°C shall be fixed in the asphalt binder feed line near the discharge valve at the mixer unit and in each asphalt binder storage tank.

260.4.2 .7 Dust Collectors

.1 Plants shall be equipped with a Dust collecting system and this system must comply with all environmental regulations including but not limited to those initiated by the Government of Canada, the Province of New Brunswick, and/or municipal and/or local regulatory agencies having jurisdiction.

.2 Plants equipped with a baghouse dust collection system shall be able to waste or uniformly return all or a portion of the fines as required to meet the ranges and tolerances indicated in Tables 260-8 and 260-9.

260.4.2 .8 Safety and Inspection Requirements

.1 Safe and adequate stairways, ladders and platforms shall be provided for access to trucks, mixer units and other plant units where inspection and sampling are required.

260.4.2 .9 Additional Requirements for Batch Mix Plants

.1 A rotary drier designed for drying and heating mineral aggregates shall be provided.

.2 The drier capacity shall be sufficient to heat aggregates to the required temperatures.

.3 Plant screens capable of efficient screening of aggregates to sizes required for proportioning each type of asphalt mix shall be provided.

  .1 Screens shall be kept clean and in good repair.

  .2 Aggregates shall be screened such that the stone portion (retained on the 4.75 mm sieve) is stored separately from the sand portion (passing the 4.75 mm sieve).

  .3 Carry-over for any mix, defined as the amount of stone which enters the sand bins and/or the amount of sand which enters the stone bins, in no case shall exceed 20 % and shall not vary by more than ±5% from the established value.

.4 Each plant shall contain a minimum of 2 hot storage bins.

  .1 Bins shall be divided into compartments of sufficient size to allow continuous operation of the plant.

  .2 Each hot storage bin shall contain a sensing device to indicate, at the control panel, when the aggregate level falls below one-third of the capacity of the bin.

    .1 When automatic batching controls are in use, batching shall not take place if the level of the aggregate, in any hot bin in use, falls below one third full.

  .3 Each compartment shall be provided with an overflow chute of such size and at such location to prevent backing up of material into other compartments.

  .4 Gates on hot storage bins shall be constructed to prevent leakage when closed.

  .5 Compartments shall be provided with suitable means of obtaining representative test samples as the aggregate is discharged.

.5 Equipment shall include a means for accurately weighing aggregate from each bin in a weighing box or hopper of ample size to hold a full batch without running over.

.6 Gates on the hopper shall be constructed to prevent leakage when closed.

.7 Scales for weighing aggregate shall be accurate to 0.5% and for asphalt binder shall be accurate to 2.0% through the working range.

.8 After plant set up and prior to batching materials and whenever deemed necessary by the Engineer, batching plant scales shall be tested for accuracy in the presence of the Engineer.

260.4.2.9 .9 Satisfactory means shall be provided to deliver the required Quantity of asphalt binder to the mix at the specified temperature.

.10 Asphalt binder shall be delivered to the mixer in a thin uniform sheet or in multiple streams over full length or width of mixer.

.11 All plants shall be equipped with a recording thermometer or pyrometer to record the temperature of the aggregate at the drier discharge chute.

.12 Plant shall include a batch mixer capable of producing a consistent and homogeneous mix.

  .1 The mixer shall be constructed to prevent leakage of contents until batch is discharged.

  .2 The mixer gate shall be equipped with a timing lock which shall lock the gate until the specified mixing time has elapsed.

260.4.2 .10 Additional Requirements for Drum Mix Plants

.1 Each cold feed bin shall have a variable speed belt feeder as well as an adjustable gate.

.2 Plant control shall be such that aggregate feed shall have both individual and total proportional control.

  .1 Monitors indicating individual cold feed bin feeder speeds shall be installed on the control panel.

.3 A means of warning the plant operator shall be provided on each aggregate bin so the flow of aggregate and asphalt binder can be stopped if the material from any aggregate bin should stop flowing.

.4 Screen(s) shall be installed on the conveyor system to prevent oversized materials from entering the drum.

.5 The conveyor belt with a load cell shall be equipped with a belt cleaner to prevent build-up of material on the belt.

.6 The total flow of aggregate shall be measured by an electronic weighing system.

  .1 The Contractor shall ensure, monitor and maintain the system so that the aggregate flow shall be interlocked with the asphalt pump and corrected for aggregate moisture content so that the proportions of aggregate and asphalt binder entering the mixer remain constant.

.7 The weighing systems for aggregates and the metering system for asphalt binder shall have provision to enable easy sampling and calibration without having the material enter the drum.

  .1 Weighing systems for weighing aggregate shall be accurate and sensitive to 0.5% over the entire working range of the maximum loading required.

260.4.2.10.7 .2 Metering systems for asphalt binder shall be accurate and sensitive to 2.0% over the entire working range.

.3 The asphalt binder system shall have provisions to compensate for fluctuations in temperature and relative density.

.8 The heating of the asphalt mix shall be controlled to prevent the fracture of the aggregate and damage to the asphalt binder.

.1 The system shall be equipped with automatic burner controls and shall provide a printed record of the mix temperature at discharge.

.2 The asphalt binder recovered by extraction from the asphalt mix shall meet the requirements of the Pressure Aging Vessel (PAV) as specified in AASHTO MP1-98, Table 1 - Performance Graded Asphalt Binder Specification.

.9 Reclaimed asphalt concrete shall not be exposed to direct flame during and/or after introduction into the plant.

.10 The mixing period and temperature shall be such as to produce a consistent and homogeneous mix at the required mix temperature.

.11 The method used to transfer the mix from the drum mixer to the haulage units shall be designed, constructed and operated so that there shall be no segregation of, damage to or loss of the mix.

260.4.2 .11 Surge Bins and Storage Silos

.1 Surge bins and storage silos, and their components shall be designed so as not to damage or segregate the mix.

.2 Storage silos equipped with a heating system shall be capable of maintaining the temperature without localized overheating.

.1 Overnight storage in the silos will not be permitted.

.3 Surge bins and storage silos shall be equipped with mix level indicators.

.4 When the plant is in continuous operation, the minimum level of mix in the silo must be maintained above the one-third capacity level.

260.4.2 .12 Placing Equipment

.1 Mechanical self-powered pavers shall be capable of spreading mix true to line, grade and cross-Slope.

.2 Pavers shall be equipped with hoppers and distributing screws to place mix evenly in front of the screeds.

260.4.2.12 .3 Pavers shall be equipped with vibrating screeds and shall be capable of spreading mixes, without segregation and with a smooth and uniform textured surface, to the required thickness and in widths from 3 to 5 m.

.1 Screeds shall be equipped with heaters which are capable of preheating the entire screed and screed extensions.

.4 The Contractor shall provide a 3 m straight edge with each paver.

.5 Pavers shall be equipped with automatic screed controls for the control of longitudinal grade and transverse Slope.

.1 The longitudinal grade control shall be equipped to operate from either side of the paver and be capable of providing longitudinal grade control as well as matching longitudinal joints.

.2 The transverse Slope control shall also be capable of operating from either side of the paver.

.3 The Contractor shall use a minimum 12 m ski/floating beam or an approved equivalent for longitudinal grade control.

.1 A joint matching shoe may be used to control longitudinal grade of subsequent mats placed adjacent to the original mat.

.4 A calibrated Slope indicator shall be installed in a readily visible location on each paver.

.6 Longitudinal grade control shall be used on all lifts and transverse Slope controls shall be used on all lifts except surface course unless otherwise directed by the Engineer.

.7 Vibrating hydraulic screed extensions and vibrating bolt-on screed extensions shall be used in placing mat widths greater than 3 m.

.1 Hydraulic strike-off extensions are only acceptable when laying mats of irregular widths outside of the driving Lanes.

260.4.2 .13 Compaction Equipment

.1 All rollers shall be of types specifically designed for asphalt compaction.

.2 Rollers shall be in good condition and capable of reversing without backlash.

.3 Steel wheeled rollers shall be equipped with a means of supplying a controlled flow of water to the wheels to prevent adhesion of the asphalt mix.

.4 Pneumatic-tired rollers shall be self-propelled with a mechanical means of adjusting the tire inflation pressure.

.5 All rollers with rubber tires shall be equipped with a means to prevent the asphalt mix from adhering to the rubber tires.

.1 Hydrocarbon fuels or solvents shall not be used.

260.4.2.13 .6 Compaction Equipment shall consist of at least one of each of the following:

- .1 vibratory roller
- .2 pneumatic tire roller
  - .1 A combination steel-drum vibratory/pneumatic tire roller may be used in place of the vibratory and pneumatic rollers.
- .3 steel-drum tandem finish roller

260.4.2 .14 Material Transfer Vehicle (MTV)

- .1 Material transfer vehicles shall be self-propelled Equipment capable of transferring asphalt concrete from the hauling equipment into the paver, and shall have the following characteristics:
  - .1 Minimum storage capacity of 20 t;
  - .2 A conveyor system to transfer asphalt concrete from the hauling equipment to the paver hopper insert; and
  - .3 An auger system in the MTV or paddle mixers in the hopper insert to remix the asphalt concrete prior to discharge from the hopper insert.
- .2 The Contractor has the option of using a material transfer vehicle for the placement of all asphalt concrete, with compensation per 260.5.4 herein.

260.4.3 Production and Placement of Asphalt Concrete Mix

260.4.3 .1 Handling and Stockpiling Aggregates

- .1 The coarse aggregate, fine aggregate and blending sand shall each be stockpiled separately.
- .2 Stockpiles shall be placed on a level, well drained base and constructed in such a manner that segregation and contamination does not occur.
  - .1 Segregation and contamination shall be measured and checked, during the normal course of the Work, by comparing stockpile samples to the average grading and tolerance requirements as previously set out.
- .3 Segregated or contaminated stockpiles will not be incorporated into the Work.
- .4 Before production of asphalt concrete is commenced, stockpiles of each size and gradation of aggregate shall be provided at the asphalt plant site, of a volume as specified in 260.2.3.3.1, unless specifically designated otherwise in writing by the Engineer, and the Contractor shall maintain this amount of material in stockpiles, until no longer applicable due to the production remaining.

260.4.3.1 .5 Aggregates shall be loaded into cold feed bins so as to prevent the intermixing of separate sizes.

.6 Mixing of materials or loading of more than one type of material into a single bin shall not be permitted.

260.4.3 .2 Physical Requirements for Asphalt Concrete

.1 Once the JMF has been designated by the Engineer, the Contractor shall produce an asphalt concrete mix to the mix control tolerances as shown in Tables 260-7 and 260-9.

Table 260-9
Asphalt Mix Control Tolerances

Tolerances

Asphalt Binder Content	± 0.3 %
4.75 mm	± 5.0 %
Passing 75 μm	± 1.0 %

260.4.3 .3 Plant Calibration and Trial Mix

.1 The asphalt plant must be calibrated, in the presence of and to the satisfaction of the Engineer, prior to commencement of each paving season for permanent plants and after each set up for portable plants or at any time the Engineer has reason to suspect that the calibration values may be incorrect.

.2 A trial mix based on the Design Mix Formula shall be prepared by the Contractor for testing by the Engineer and shall only be carried out during daylight hours.

.3 Continuous placement of asphalt concrete in the Work shall only be permitted after the Engineer is satisfied that the mix properties are in accordance with the applicable specified requirements.

.4 Trial mixes are the property of the Contractor and shall be placed outside the Work Site, unless otherwise authorized by the Engineer for the purpose of padding or patching.

260.4.3 .4 Mixing Times and Temperatures

.1 For batch plants, the wet mixing time, beginning when the asphalt binder is introduced into the pugmill, shall be 35 seconds, longer if required, to produce a homogeneous mix where all of the aggregate is thoroughly coated with asphalt binder.

.2 The mixing time for drum mix plants shall be such to produce a homogeneous mix where all of the aggregate is thoroughly coated with asphalt binder.

  .1 For mixes containing RAP, the mixing time shall be adjusted so that all heat transfer occurs in the drier drum.

260.4.3.4 .3 Mixing temperature for all types of plants shall be such that the temperature of the asphalt concrete mix when discharged from the mixer unit shall be controlled within ± 5°C of the temperature requirement of the DMF, unless otherwise authorized by the Engineer.

.1 The minimum mixing temperature shall be 115°C.

.2 The maximum mixing temperature shall be 165°C or the temperature recommended by the asphalt binder supplier.

260.4.3 .5 Moisture Content

.1 The maximum moisture content allowed in the asphalt concrete mix as it is discharged to the surge bin, storage silo, or pug mill shall not exceed 0.15%.

.2 The aggregate shall be dried sufficiently so that visual evidence of moisture, such as but not limited to the presence of foaming, slumping or Stripping of the mix, does not occur.

260.4.3 .6 Transportation of Asphalt Concrete

.1 Trucks for transporting asphalt concrete mixes shall have tight, metal boxes free of foreign materials.

.2 Loads shall be covered with tarpaulins of sufficient size to overhang the fully loaded truck boxes and be tied down on three sides and the front shall be tight to the box of the truck or shielded to prevent air infiltration.

.3 Truck boxes may be lightly lubricated with an environmentally acceptable release agent, as required, but must be raised and drained after each application and before loading.

.1 Hydrocarbon fuels or solvents shall not be used.

.4 Tarpaulins shall be rolled back and the hot asphalt concrete shall be uncovered immediately prior to dumping the load into the paver.

260.4.3 .7 Timing of Paving Operations

.1 Paving operations shall not commence in the spring until the DOT Weight Restrictions are lifted or continue after the dates specified in Table 260-10 without written permission of the Engineer.

Table 260-10
Cut-off Dates for Paving

County	Surface mixes	Base mixes
Gloucester, Madawaska, Restigouche, Victoria	September 30	October 15
All others	October 15	October 31

260.4.3.7 .2 Paving operations shall only be conducted during the daylight hours unless specifically altered by written approval by the Engineer.

.3 The placement of the new asphalt concrete mix shall take place within 7 Days of the commencement of the cold milling operation.

.4 When the RAP is being reused in a recycled asphalt concrete mix, the placement of the asphalt concrete shall commence within 14 Days of the availability of the RAP required to carry out an asphalt concrete mix design.

260.4.3 .8 Placing Asphalt Concrete

.1 The Contractor shall place asphalt concrete on a dry surface.

  .1 Asphalt concrete shall not be placed under adverse weather conditions of precipitation.

  .2 When placing asphalt concrete surface mix, the surface temperature of the material to be overlaid shall be a minimum of 5°C.

.2 When paving on an Aggregate Base, the Aggregate Base must be free from standing water and at least 300 m of prepared base shall be maintained ahead of pavers.

.3 All prepared surfaces shall be cleaned of loose or foreign material prior to placing of the asphalt concrete.

  .1 Milled and aged asphalt concrete surfaces shall be treated with bituminous tack coat in accordance with Item 259 prior to the placing of asphalt concrete.

.4 Existing approaches to railway crossings and Bridge Structures, or areas adjacent to paved surfaces or other Structures, shall be removed to the depths shown on the Contract Documents or as directed by the Engineer.

  .1 The removed materials shall be disposed of and the exposed surfaces shall be prepared as identified in the Contract Documents or as directed by the Engineer.

.5 Contact edges of existing mats and contact faces of curb, gutters, manholes, Sidewalks and Bridge structures shall receive an application of tack coat before placing the asphalt concrete.

.6 The temperature of the asphalt concrete shall be a minimum of 115 °C prior to initial compaction.

.7 The maximum temperature of the asphalt concrete mix shall be 165 °C or the temperature recommended by the asphalt binder supplier.

.8 When laying base and/or surface course the alignment of the paver shall be controlled by an approved method, such as following a stringline, placed by the Contractor from an alignment designated by the Engineer.

260.4.3.8 .9 Irregularities in alignment and grade along the outside edge of the asphalt concrete shall be corrected by the addition or removal of asphalt concrete before the edge is rolled.

.10 The cross slope of the asphalt concrete surface shall be within ± 0.5 % (±15 mm when measured over 3 m, perpendicular to the centreline) of the cross slope specified in the Contract Documents or provided by the Engineer.

.11 In narrow base widening, deep or irregular sections, intersections, turn-outs or driveways where it is impractical to spread and finish asphalt concrete by machine methods, the asphalt concrete shall be spread by hand in accordance with standard hand placement practices.

.12 Paving of intersections, extra widths and other variations from standard Lane alignment and as defined in the Contract Documents, whether by hand spreading or machine laying, shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Engineer.

  .1 Driveway entrances and aprons shall be paved concurrently or after the machine laying operation of the regular mat.

.13 Spreading of asphalt concrete by hand shall be kept to a minimum and shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Engineer.

.14 Adjacent asphalt concrete mats, including those placed on shoulders, shall be completed to approximately the same location at the end of each day's paving.

.15 For ESAL counts equal to or greater than 3 million, no traffic shall be permitted on the newly placed asphalt concrete until finish rolling is complete, and the finished mat has been permitted to cool to 60°C.

  .1 Water required to lower the mat temperature shall be supplied in accordance with Item 191.

.16 Damage to the mat as a result of contaminant spills from the Contractor's Equipment shall be immediately repaired by the Contractor to the satisfaction of the Engineer.

.17 All placement, spreading, compacting and rolling shall occur only during daylight hours, and any loads arriving at the Work Site such that these requirements cannot be met shall be rejected by the Engineer.

260.4.3 .9 Padding

.1 Material for padding shall be the same asphalt concrete mix designation as specified in the Contract Documents.

.2 Asphalt concrete for padding shall be placed by means of a self-powered paver or by other means approved by the Engineer.

260.4.3.9 .3 The compaction Equipment shall be in accordance with 260.4.2.13.6.

.1 For padding, 260.4.5.1 and 260.4.5.2 shall not apply.

.2 The Contractor shall establish a rolling pattern to achieve the maximum compaction of the asphalt concrete used for padding.

.4 Padding is intended to be a separate operation and shall not be done as part of the construction of the subsequent lift of asphalt concrete.

260.4.3 .10 Joints

260.4.3.10 .1 General

.1 Joints shall be constructed to ensure thorough and continuous bond and to provide a smooth riding surface.

.2 Dirt or other foreign and loose material shall be removed from the faces against which joints are to be made.

.3 The Contractor shall remove and dispose of waste materials, resulting from joint construction or other Work activity, outside the Work Site before the end of each week.

260.4.3.10 .2 Transverse Construction Joint

.1 A Transverse Construction Joint shall be constructed at the end of each day's Work and at other times when paving is halted for a period of time which will permit the asphalt concrete to cool below 115°C.

.2 Where the asphalt concrete surface and/or base course has been terminated due to the conditions noted in 260.4.3.10.2.1; a smooth 1.5m long taper shall be paved.

.3 When paving resumes, tapers from surface courses previously laid shall be cut back to full mat thickness to expose fresh, straight vertical surfaces, free from broken or loose material and tacked in accordance with 259.2, 259.3 and 259.4.

260.4.3.10 .3 Transverse Key Joint

.1 A transverse key joint shall be constructed, as per Standard Drawing 260-1, between existing and new asphalt concrete Pavement at the beginning and at the end of the project and other locations where the new Pavement terminates against an existing Pavement.

.2 If a transverse key is cut in advance of paving the joint area, the Contractor shall immediately construct with hot mixed asphalt concrete a smooth 1.5 m long taper at the joint area, as shown in Standard Drawing 260-1.

260.4.3.10.3 .3 Prior to the placement of the asphalt concrete, all transverse key joint surfaces shall be cleaned of loose foreign material and a tack coat applied in accordance with 259.2, 259.3, and 259.4.

260.4.3.10 .4 Longitudinal Construction Joint

.1 The following requirements shall apply when constructing longitudinal joints.

.1 Widths of succeeding individual courses shall be offset by 50-100 mm.

.2 Contractors using a one paver operation between May 15th and September 15th may leave an exposed longitudinal joint for up to one-half of the day's production without an application of tack coat unless otherwise directed by the Engineer.

.1 Before May 15th and after September 15th the Contractor shall be required to tack the longitudinal joint in accordance with 259.2, 259.3 and 259.4.

.3 All longitudinal joints left exposed overnight or which are exposed to moisture shall receive an application of tack coat in accordance with 259.2, 259.3 and 259.4.

.4 Longitudinal joints shall not be permitted between the edges of driving Lanes in the final lift of asphalt concrete.

.5 Longitudinal joints shall be constructed to ensure that maximum compression under rolling is achieved.

.6 On surface courses, the method of making joints shall be such that excess material is not scattered on the surface of the freshly laid mat and all excess material shall be carefully removed.

260.4.3 .11 Compaction of Asphalt Concrete

.1 Quality control testing shall be the responsibility of the Contractor.

.2 Quality assurance testing shall be carried out in accordance with 260.4.5.

.3 If damage to Highway components and/or adjacent property is occurring while using vibratory compaction Equipment, the Contractor shall immediately cease using this Equipment and proceed with the Work using static rolling Equipment.

.4 Along curbs, manholes and similar Structures and places not accessible to full size rollers, the mix shall be compacted with either smaller compactive Equipment, such as vibrating plate tampers, or by hand tampers.

260.4.3 .12 Additional Requirements for Bridge Deck Paving

.1 The Contractor shall place asphalt concrete on the deck waterproofing system in accordance with the waterproofing manufacturer's recommendation and/or procedures.

.2 The Contractor shall be responsible for all damage to the waterproofing membrane resulting from any aspect of the paving operation.

  .1 Should the membrane become damaged, paving operations shall be immediately stopped and repairs made, in accordance with the manufacturer's instructions, before paving recommences.

.3 Expansion joints shall be protected from damage from Equipment passing over them.

  .1 The placing of the asphalt concrete at expansion joints shall be completed as indicated on Standard Drawing 260-2.

.4 The Contractor shall submit a rolling pattern for the approval of the Engineer.

.5 A steel-drum tandem roller, operating in the non-vibratory mode and exerting a contact pressure on compression roll of at least 3.0 kg/mm of drum width shall be the breakdown roller required for Bridge deck paving.

.6 The breakdown roller shall be required to run off the deck to stop and turn.

.7 After breakdown rolling, the mat shall be rolled with a pneumatic tired roller, taking care not to displace the mat when stopping or turning.

.8 The mat shall be finish rolled to remove any marks.

.9 For Bridge decks, 260.4.5.1 and 260.4.5.2 shall not apply.

260.4.3 .13 Temporary Pavement Markings

.1 The Owner will supply temporary Pavement markings to the Contractor in the form of marking strips or raised markers, for placement as temporary centreline, laneline or edgeline delineation.

.2 Temporary markings shall not be placed on the chip seal surface.

.3 The raised markers shall not be used to delineate centreline except on milled surfaces.

.4 On new or milled Pavement exposed to traffic, the temporary markings shall be placed on the same day as the paving or milling.

.5 Markings shall be strips 2 m long, or groups of three raised markers equally spaced over a 2 m length, oriented longitudinally and placed every 50 m on tangents and 25 m on horizontal and vertical curves.

.6 The Contractor shall replace damaged or missing markings at the end of the day.

260.4 .4 Quality Control Testing

260.4.4 .1 Sampling and Testing of Aggregates

.1 The crushed product shall be monitored throughout the period of the Work and shall be accepted or rejected on the basis of the testing performed by the Engineer.

.2 The material being produced shall be sampled, reduced to testing size and tested in accordance with DOT Manual: Sampling and Testing of Aggregates, Item 260.

  .1 Sampling and testing will be performed at the minimum frequency of 3 times per shift.

    .1 Shift is defined as one production crew's daily work period.

.3 The Contractor shall be provided a copy of all test results as soon as they are available and shall be notified if any test result indicates that materials are being produced outside of the specified limits.

260.4.4 .2 Control of Aggregate Production and Stockpiling

.1 The Contractor shall not place any material into the production stockpile after notification under 260.4.4.1.3 that the material being produced is outside the specified limits.

.2 Once a test result indicates that the material being produced does not meet the specified limits in Tables 260-5 and 260-6; the material shall be handled as follows:

  .1 The test result that is out of specification shall be averaged with the previous test result and if the average of the two is within the specified limits, the material shall be placed into the production stockpile.

  .2 If the average of the two test results falls outside the specified limits, the material shall be "held" in a separate and clearly defined stockpile until two acceptable consecutive test results are obtained.

    .1 After two acceptable consecutive test results are obtained the material being produced shall be placed in the production stockpile.

  .3 A stockpile of "held" material produced outside the average grading tolerance limits in Table 260-6 may be considered for incorporation into the Work if the test results are within the pegged limits in Table 260-5 and the test results indicate that a new average grading may be established for that material.

    .1 The held stockpile shall remain separate from the production stockpile.

    .2 The Engineer will determine a new average grading for the material in the held stockpile(s), which may require a new mix design.

    .3 The sequence of handling the material produced is indicated in Table 260-11.

Table 260-11
Schematic Representation of Handling Procedure

Two consecutive tests within Specifications		Place in production stockpile
One test outside Specifications	Average with previous test result, if within specified limits in Table 260-5 & Table 260-6	Place in production stockpile
One test outside Specifications	Average with previous test result, if average not within specified limits in Table 260-5 & 260-6	"Hold" material until two consecutive tests within Specifications

260.4.4 .3 Sampling and Testing of Asphalt Concrete Mix

.1 Asphalt concrete mix production will be monitored throughout the period of the Work and will be accepted or rejected on the basis of the testing performed by the Engineer.

.2 The asphalt concrete mix being produced will be sampled at a minimum frequency of once per shift.

  .1 Shift is defined as one production crew's daily work period.

.3 The asphalt concrete mix will be sampled and tested according to DOT Manual: Sampling and Testing of Asphalt Concrete Mix and Pavement Cores, Item 260.

.4 The Contractor will be provided a copy of all test results as soon as they are available and will be notified if any test result indicates that materials are being produced outside of the specified limits.

260.4.4 .4 Control of Asphalt Concrete Mix Production

.1 Once a test result indicates that the material being produced does not meet the specified limits in Tables 260-7 and 260-9 the material shall be handled as follows:

  .1 The Engineer may suggest changes to the constituent materials to return test properties within the specified limits.

  .2 The Contractor may suggest changes to asphalt plant settings to return test properties within specified limits.

.2 Regardless of any changes being made, a second mix sample will be obtained from plant production and tested within one hour of notification that the asphalt concrete mix test results do not meet specified limits.

260.4.4.4 .3 If the test result from the second sample indicates that the mix does not meet the specified limits , plant production may be suspended.

  .1 Plant production of asphalt concrete mix shall not resume until an acceptable trial mix is produced in accordance with 260.4.3.2 and 260.4.3.3.

.4 The Engineer may request the asphalt concrete mix be removed if it is determined that asphalt concrete placed is not within the specified limits.

260.4.4 .5 Compaction Testing

.1 The Contractor shall be responsible for quality control testing for the compaction stage of the Work to ensure that the density conforms with the requirements of this Item.

260.4.5 Quality Assurance Testing and Adjustments

260.4.5 .1 Asphalt Density

.1 Compaction testing shall be based on a Lot average method.

.2 A Lot is defined as the portion of the Work being considered for acceptance and is further defined as the following:

  .1 One day's production and placement of 500 t or more of asphalt concrete, excluding the quantity in the Shoulder area where only a single lift of surface mix is placed.

  .2 One day's production and placement of less than 500 t of asphalt concrete, excluding the quantity in the Shoulder area where only a single lift of surface mix is placed, will be evaluated as follows:

    .1 The quantities for that day and the next day that meet the criteria of 260.4.5.1.2.1 will be added together, and the total will be designated as a Lot.

    .2 If it is the last time the mix is produced meeting these criteria, that day's quantity will be included in the previous day's Lot.

  .3 A separate Lot will be established if, in the Engineer's opinion, conditions of construction indicate that it is likely that a portion of a day's production and/or placement will be significantly different from the remainder of the day's production and/or placement.

.3 Pavement samples will be taken on the road by coring at stratified random sample locations.

.4 Sample locations will be determined by the Engineer using stratified random sample procedures, in which the Lot is divided into segments as shown in Table 260-12, and a random sample is taken from each area or segment in an unbiased way.

Table 260-12
Segments per Lot

Asphalt Concrete Tonnage in Lots to be Cored	Segments per Lot
less than 1000 t	3
1000 to 1500 t	4
more than 1500 t	5

260.4.5.1 .5 The Lot will be divided into segments of approximately equal length.

.1 In each segment a test site will be located by using random numbers to determine the longitudinal distance from the end of the segment and the lateral distance from the edge of the segment.

.2 In no case will a lateral distance be less than 0.3 m from the edge of the mat.

.6 The following areas will not be cored:

.1 The Shoulder area where only a single lift of asphalt concrete surface mix is placed, for which the Contractor shall establish a rolling pattern to achieve the maximum compaction of the asphalt concrete.

.2 Areas of obvious surface defects as indicated in 260.4.5.3, which shall be marked and repaired in accordance with 260.4.5.4.

.3 Small areas such as tapers, aprons, Bridge approaches, gores and areas of handwork, and for asphalt mix used for isolated levelling and repair of failed areas.

.7 Cores shall be obtained in accordance with ASTM D5361, within a minimum of 12 hours and a maximum of 24 hours after the placement of the Lot.

.1 The maximum may be extended to 72 hours in order to exclude Saturday and Sunday unless the Contractor is placing asphalt concrete on either Day.

.8 The Contractor shall carry out the coring in the presence of the Engineer.

.1 The cores shall be a nominal 100 mm diameter.

.2 The Contractor shall reinstate the Pavement at each core sample location in conjunction with removal of the core by dewatering the core hole and filling it with hot mixed asphalt concrete in 50 mm lifts to the Pavement surface elevation, compacting each lift with 25 blows using a standard compaction device.

.9 The Engineer will be responsible for labelling the cores.

.10 The Contractor shall be responsible for the storage and transportation of the cores to the Owner's Laboratory, within 2 hours of coring, for testing.

260.4.5.1 .11 Mat densities will be tested by the Engineer by core analysis throughout the course of the Work and shall Conform to the density requirements indicated in Table 260-13.

.12 The percent compaction of a Lot will be determined by comparing the average of the core bulk densities, in accordance with ASTM D2726, with the average theoretical maximum density of the loose mix samples, in accordance with AASHTO T209-99.

.13 The Engineer will provide the Contractor with a copy of the results of acceptance tests within one working Day of their availability.

.14 The procedure for dealing with an outlier test shall be as follows:

.1 When an individual compaction test result from a Lot is questionable, the validity of the test result in question will be determined in accordance with ASTM E178, Standard Practice for Dealing with Outlying Observations using a "t" test at a 5 percent significance level.

.2 If the outlier test procedure shows that the challenged test result is valid then the test result will be used in the calculations.

.15 The conditions and procedures for an appeal of the Lot test results shall be as follows:

.1 The Contractor may appeal the results of acceptance testing of the density for any rejected or penalized Lot only once.

.2 Appeals shall be for all tests in the Lot.

.3 Any attempt to improve density on the appealed Lot after the Engineer has tested the Lot for acceptance shall void the appeal and the original test results will apply.

.4 The Contractor shall serve notice of appeal to the Engineer, in writing, within 48 hours of receipt of the test results.

.5 The Contractor shall take additional cores, in accordance with Table 260-12, at random locations, as determined by the Engineer, within 48 hours of the Contractor's notice of appeal and these cores will be tested by the Engineer.

.6 The Contractor may have a representative present during the period of the testing; the Contractor's representative shall comment on anything concerning the testing which he does not consider to be valid and the Engineer shall respond to all comments in order to resolve them.

.1 Prior to leaving the testing Laboratory any unresolved comments regarding the testing procedures are to be given to the Engineer in writing.

.2 Any comments, with respect to the testing procedures, which are made subsequent to the Contractor's representative leaving the Laboratory, will not be considered.

260.4.5.1.15 .7 The test results from the original Lot will be combined with the test results of the new samples.

.1 A new sample mean for the combined test results will be determined and this value will be used for acceptance and Unit Price adjustment.

.2 The new mean so obtained shall be binding on both the Contractor and the Owner.

260.4.5 .2 Smoothness

260.4.5.2 .1 General

.1 The Profile requirements shall be specified in the Contract Documents.

.2 The smoothness of the final lift of newly placed asphalt concrete Pavement will be checked with a High Speed Profiler as soon as possible after final rolling.

.3 The profile will be checked along the traffic wheel paths in accordance with ASTM E950.

.4 The Profile Index (smoothness) for each Lane is the cumulative Profile reading of the outer wheel path in millimetres per 100 m section, in excess of the 5 mm blanking band.

260.4.5.2 .2 Full Profile Requirement

.1 The final lift of Pavement shall conform to the Profile Index requirements as indicated in Table 260-14.

.2 Pavement sections with a Profile Index outside of those indicated as Full Payment in Table 260-14 will be subject to payment adjustment as described in 260.5.3 or repair in accordance with 260.4.5.4.4.

.3 For individual bumps/dips exceeding 8.5 mm, 260.4.5.2.3.1 will apply.

260.4.5.2 .3 Bump/Dip Profile Requirement

.1 Individual bumps/dips exceeding 8.5 mm as detected by the profiler will be subject to payment adjustment as described in 260.5.3 or the Contractor may opt to repair these bumps/dips in accordance with 260.4.5.4.4.

.2 The Bump/Dip profile requirements shall apply to interchange ramps.

260.4.5 .3 Surface Defects

.1 The finished surface of any Pavement course shall have a uniform texture and be free of visible signs of poor workmanship and bumps and/or dips exceeding 3 mm as measured with a 3 m straight edge.

.2 Any obvious defects, as determined by the Engineer, will be cause for rejection of the Pavement course.

260.4.5.3 .3 Defects shall include but not necessarily be limited to the following:

- .1 Segregated areas.
- .2 Areas of excess or insufficient asphalt binder.
- .3 Roller marks.
- .4 Cracking or tearing.
- .5 Improper matching of longitudinal and transverse joints.
- .6 Tire marks.
- .7 Sampling locations not properly reinstated.
- .8 Improperly constructed patches.
- .9 Contaminant on the mat.
- .10 Flushed areas.

260.4.5 .4 Repairs

260.4.5.4 .1 General

.1 Repairs to the Work to improve smoothness shall be carried out in accordance with this Item within 30 Days from the time the Contractor receives the Engineer's written assessment of the Work, but in no case later than October 15th of the year that the asphalt concrete was placed.

.2 Repairs to correct surface defects shall be carried out in accordance with this Item within one year from the time the Contractor completes placement of the asphalt concrete.

.3 The asphalt concrete used for replacement or overlay to correct surface defects shall be the same asphalt concrete mix designation as that which is removed or overlaid.

.1 Any asphalt concrete which does not conform to the requirements of this Item shall not be incorporated in the Work.

.4 Repairs required in accordance with 260.4.5.2 shall be carried out for the full width of the driving Lane.

260.4.5.4 .2 Removal and Replacement

.1 The full thickness of the appropriate lift of rejected Pavement course shall be removed by cold milling or other means as approved by the Engineer.

.2 All joints shall be tack-coated.

260.4.5.4.2 .3 Repaired areas will be retested for acceptance; those failing will be rejected and shall require further repair.

.4 Material removed shall become the property of the Contractor, who shall dispose of the material outside the Work Site.

260.4.5.4 .3 Overlaying

.1 The overlay shall extend the full width of the underlying Pavement surface and have a finished compacted thickness of not less than 50 mm for base course and 40 mm for a surface course.

.2 A key shall be constructed at each end of the overlaid section as per Standard Drawing 260-1.

.3 If an overlay results in the need for repairs or adjustments to the adjacent materials within the Work Area, the Contractor shall carry out the repairs and adjustments at his own expense and to the satisfaction of the Engineer.

.4 Repaired areas will be retested for acceptance.

  .1 Those failing will be rejected and a second overlay will not be permitted.

  .2 The Contractor shall then carry out repairs in accordance with 260.4.5.4.2.

  .3 Removal depth shall be sufficient to remove the full thickness of the overlay lift and the original unsatisfactory surface lift.

260.4.5.4 .4 Rolling

.1 Rolling of bumps/dips to repair smoothness deficiencies will be permitted.

  .1 Neither 260.4.5.4.2 nor 260.4.5.4.3 will be permitted to repair smoothness deficiencies.

.2 Should excessive damage occur to the asphalt concrete mat due to rolling, the Contractor shall remove and replace the damaged area in accordance with 260.4.5.4.2.

260.5 MEASUREMENT FOR PAYMENT

260.5 .1 General

.1 The Quantity to be measured for payment shall be the number of tonnes of asphalt concrete placed, in accordance with this Item, subject to payment adjustments.

260.5 .2 Payment Adjustment For Density

.1 The Unit Price adjustment for density shall be as shown in Table 260-13.

.2 For asphalt concrete placed as padding, on Shoulders where a single lift of asphalt concrete surface mix is specified and on Bridge decks, the Unit Price adjustment as shown in Table 260-13 shall not apply.

.3 If repairs are carried out by removal and replacement or overlay of the asphalt concrete, the Unit Price adjustment will be based on quality assurance carried out on the repaired Lot.

Table 260-13
Unit Price Adjustment For Density

% of Theoretical Maximum Relative Density	Unit Price Adjustment
Lot Average	**$ per Tonne**
93.0	+0.50
92.9	+0.40
92.8	+0.30
92.7	+0.20
92.6	+0.10
92.5	0.00
92.4	-0.10
92.3	-0.20
92.2	-0.30
92.1	-0.40
92.0	-0.50
91.9	-0.60
91.8	-0.70
91.7	-0.80
91.6	-0.90
91.5	-1.00
91.4	-1.20
91.3	-1.40
91.2	-1.60
91.1	-1.80
91.0	-2.00
90.9	-2.40
90.8	-2.80
90.7	-3.20
90.6	-3.60
90.5	-4.00
90.4	-4.40
90.3	-4.80
90.2	-5.20
90.1	-5.60
90.0	-6.00
89.9	-7.00
89.8	-8.00
89.7	-9.00
89.6	-10.00
89.5	-11.00
89.4	-12.00
89.3	-13.00
89.2	-14.00
89.1	-15.00
89.0	-16.00
<89.0	reject

continued next column

260.5 .3 Payment Adjustment For Smoothness

.1 The payment adjustment for smoothness shall be as shown in Table 260-14.

.2 Individual bumps and dips shall be assessed in accordance with the schedule set out in Table 260-15.

260.5.3 .3 Penalty or bonus assessments for Profile Index readings shown in Table 260-14 and the bump and dip penalties shown in Table 260-15 shall be based on smoothness tests following the Contractor's final corrective efforts.

.4 For asphalt concrete placed on Bridge decks, the payment adjustments as shown in Tables 260-14 and 260-15 shall not apply.

.5 The payment adjustments in Table 260-14 will apply only to the Quantity of asphalt concrete in the final lift within the driving Lanes, as calculated using the application rate (kg/m²) as specified in the Contract Documents or as specified by the Engineer.

Table 260-14
Payment Adjustment For Smoothness

Profile Roughness Index (PRI) per 100 m Section Profiled		
Tangents & Curves with a Radius Greater Than or Equal To 600 m	**Curves with a Radius Less Than 600 m Including Transitions**	**Percent of Unit Price to be Paid**
0 to 2.4 mm	0 to 4.4	105%
2.5 to 4.4 mm	4.5 to 8.4 mm	104%
4.5 to 6.4 mm	8.5 to 12.4 mm	103%
6.5 to 8.4 mm	12.5 to 16.4 mm	102%
8.5 to 10.4 mm	16.5 to 20.4 mm	101%
10.5 to 15.4 mm	20.5 to 25.4 mm	100%
15.5 to 17.4 mm	25.5 to 27.4 mm	98%
17.5 to 19.4 mm	27.5 to 29.4 mm	96%
19.5 to 21.4 mm	29.5 to 31.4 mm	94%
21.5 to 23.4 mm	31.5 to 33.4 mm	92%
23.5 to 25.4 mm	33.5 to 35.4 mm	88%
25.5 to 27.4 mm	35.5 to 37.4 mm	84%
27.5 to 29.4 mm	37.5 to 39.4 mm	80%
29.5 to 31.4 mm	39.5 to 41.4 mm	76%
31.5 to 33.4 mm	41.5 to 43.4 mm	72%
33.5 to 35.4 mm	43.5 to 45.4 mm	68%
35.5 to 37.4 mm	45.5 to 47.4 mm	64%
37.5 to 39.4 mm	47.5 to 49.4 mm	60%
≥ 39.5 mm	≥ 49.5 mm	56%

Table 260-15
Bump And Dip Penalty Schedule

Bump/Dip	Penalty
8.5 to 9.4 mm	$ 100.00
9.5 to 10.4 mm	$ 200.00
10.5 to 11.4 mm	$ 400.00
11.5 to 12.4 mm	$ 600.00
12.5 to 13.4 mm	$ 800.00
13.5 to 14.4 mm	$1000.00
14.5 to 15.4 mm	$1200.00
15.5 to 16.4 mm	$1400.00
16.5 to 17.4 mm	$1600.00
17.5 to 18.4 mm	$1800.00
≥ 18.5 mm	$2000.00

260.5 .4 Payment Adjustment for Use of Material Transfer Vehicle (MTV)

.1 A unit price adjustment of + $3.00/t shall apply to the total quantity of asphalt concrete acceptably placed using a material transfer vehicle in accordance with this Item.

260.5 .5 Payment Adjustment for Change in PG Asphalt Binder Price

.1 Compensation payable to the Owner or the Contractor, for the difference in price of Asphalt Binder between the time of tender opening for this Contract and the time of the Work under this Item, will be calculated in accordance with the Contract Documents.

260.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of asphalt concrete, as identified under the Contract.

.2 Compensation to the Contractor or the Owner for differences between the asphalt binder content, as determined by storage tank measurements, and the assumed asphalt binder content specified in 260.2.3.1 for the total payable tonnage, will be as follows:

  .1 Payment to the Contractor will be made for asphalt binder content in excess of the assumed asphalt binder content specified in 260.2.3.1 for the total payable tonnage.

  .2 Credit shall be given to the Owner for all asphalt binder content below the assumed asphalt binder content specified in 260.2.3.1 for the total payable tonnage.

  .3 Payments and credits will be based on the actual price per tonne as invoiced to the Contractor by the supplier for the Work.

260.6.2 .4 Payments and credits will be determined upon completion of the Work.

.5 This determination is independent from and has no relationship to calculations for determining Unit Price adjustments as determined under 260.5.

.3 In the case that the Contractor initiates an appeal under 260.4.5.1.15, the following shall apply:

.1 If the new test results after the appeal process indicate that a penalty no longer applies, then the testing costs incurred by the Owner during the appeal procedures for that Lot will be borne by the Owner.

.1 Payment to the Contractor will be made for the sampling costs.

.2 If the new test results after the appeal process verify that a penalty still applies or rejection remains valid for that Lot, the testing costs incurred by the Owner during the appeal procedure shall be charged, in accordance with Item 810, to the Contractor.

.4 If the Contractor carries out improvements for smoothness including repairs to individual bumps and/or dips, the smoothness shall be retested.

.1 The Contractor shall be charged for the smoothness retesting in accordance with Item 810.

.5 Anti-stripping admixtures, approved by the Engineer, shall be paid in accordance with Item 810.

.6 Haulage for blending sand shall be paid for in accordance with Item 801.

.1 Payment to the Contractor shall be adjusted for the moisture content, as determined by sampling and testing carried out by the Engineer.

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261.8 BASIS OF PAYMENT 261-36

261.1 DESCRIPTION

261.1 .1 General

.1 This Item consists of the supply and placement of hot mixed conventional asphalt concrete and recycled asphalt concrete.

.2 The asphalt concrete shall be identified by the following mix designations:

  .1 Hot mixed conventional asphalt concrete base mix - B.

  .2 Hot mixed conventional asphalt concrete base/surface mix - C.

  .3 Hot mixed conventional asphalt concrete surface mix - D.

  .4 Hot mixed recycled asphalt concrete base mix - HRB.

.3 It shall be the Contractor's responsibility to provide an acceptable product as specified.

  .1 The Contractor shall implement and maintain a quality control system that will provide assurance that all components, as well as end result products, submitted to the Owner for acceptance, Conform to the Contract requirements.

  .2 This responsibility is without regard to whether the products are manufactured by the Contractor or purchased from suppliers or subcontractors.

.4 Quality assurance tests shall be performed, by the Engineer, on random samples taken either at the job site or at the supplier's plant.

261.1 .2 Definitions

261.1.2 .1 End Result Specification (ERS)

.1 ERS - a Specification under which the Engineer monitors the Contractor's control of the process that produces the items of construction and accepts or rejects the end product according to a specified quality assurance plan; the Contractor is entirely responsible for quality control; end product acceptance is the responsibility of the Owner and includes a statistically oriented program of quality assurance testing.

261.1.2 .2 Design Mix Formula (DMF)

.1 DMF -the Laboratory determination of the precise proportions of asphalt binder and aggregates to be blended together to meet the specified properties for the asphalt concrete mix.

261.1.2 .3 Job Mix Formula (JMF)

.1 JMF - the establishment of the single definite percentage passing the 4.75 mm and 75 μm sieve fraction of aggregate, the percentage of blending sand and the asphalt binder content that will produce the desired mix properties under field conditions.

  .1 Percentage of constituent materials to be listed on the JMF sheet.

261.1.2 .4 Asphalt Binder Content

- .1 Design Asphalt Binder Content - the asphalt binder content established by the DMF.

- .2 Approved Asphalt Binder Content - the asphalt binder content determined by the JMF.

- .3 Actual Asphalt Binder Content - the amount of asphalt binder in the mix as determined by ASTM D2172 or DOT Asphalt Plant Technician Certification Manual, Procedure # 9.

261.1.2 .5 Lot

- .1 Lot - a portion of the Work being considered for acceptance and is further defined as the following:

  - .1 A plant production of 2400 t ± 50 t where approved changes to the Job Mix Formula have not occurred.

  - .2 If it is the last time the mix is produced with this criterion the following shall apply:

    - .1 If the plant production is 800 t or less the production will be added to the previous Lot.

    - .2 If the plant production is more than 800 t but less than 2400 t, the production will be designated as a Lot.

  - .3 A separate Lot will be established if, in the Engineer's opinion, conditions of construction indicate that it is likely that a portion of a Lot will be significantly different from the remainder of that Lot.

261.1.2 .6 Stratified Random Sample

- .1 Stratified Random Sample - the division of the Lot into 3 or more areas or segments; a random sample is taken from each area or segment in an unbiased way.

261.1.2 .7 Sample Mean

- .1 Sample Mean - the arithmetic mean of a set of 3 or more test results constituting the sample.

261.1.2 .8 Mean of the Deviations

- .1 Mean of the Deviations - the sum of the absolute values of the deviations from the JMF or the air voids (4.00%) divided by the number of tests in the Lot.

261.1.2 .9 Thickness

.1 Thickness - the specified application rate divided by the bulk relative density obtained from the core samples.

261.2 MATERIALS

261.2 .1 Material Properties

261.2.1 .1 Asphalt Binder

.1 Asphalt binder shall be supplied by the Contractor.

.2 The asphalt binder grade shall be as specified in the Contract Documents.

.3 Performance Grade (PG) asphalt binder shall meet the requirements of AASHTO M320, Table 1 - Performance Graded Asphalt Binder Specification.

.4 When anti-Stripping admixtures are required, the asphalt binder grade shall meet the specified requirements of 261.2.1.1.3, after the addition of the required admixtures.

261.2.1 .2 Coarse Aggregate

.1 Coarse aggregate shall be supplied by the Contractor.

.2 The coarse aggregate shall be prepared by crushing rock or gravel and shall consist of hard, sound, durable particles, free from adherent coatings, shale, clay, loam, schist and other soft or disintegrated pieces, or other deleterious substances.

.3 Coarse aggregate is the portion retained on the 4.75 mm sieve, tested in accordance with ASTM C136, and shall meet the physical requirements of Table 261-1.

.4 Coarse aggregate may be produced from pit run gravel by crushing the fraction retained on the 31.5 mm sieve, provided that no more than 10% of the retained material passes the 31.5 mm sieve, as determined by ASTM C136 and C117.

.5 Coarse aggregate may also be accepted or rejected on the basis of past performance.

261.2.1 .3 Fine Aggregate

.1 Fine aggregate shall be supplied by the Contractor.

.2 Fine aggregate shall be prepared by crushing rock or gravel or screening a manufactured sand and shall consist of hard, sound, durable particles free from adherent coatings, shale, clay, loam, schist and other soft or disintegrated pieces, or other deleterious substances.

261.2.1.3 .3 Fine aggregate shall be the portion passing the 4.75 mm sieve, when tested in accordance with ASTM C117 and C136, and shall meet the physical requirements of Table 261-1.

Table 261-1
Superpave Asphalt Concrete Mix Requirements

Sieve Size ASTM Designation		Type B/HRB	Type C	Type D
		% (by mass) Passing Each Sieve		
Coarse Aggregate	25.0 mm	100.0	-	-
	19.0 mm	84.0-98.0	-	-
	16.0 mm	72.0-94.0	100.0	-
	12.5 mm	60.0-87.0	88.0-98.0	100.0
	9.5 mm	51.0-75.0	68.0-90.0	76.0-98.0
	6.3 mm	41.0-66.0	54.0-77.0	60.0-84.0
Fine Aggregate	4.75 mm	34.0-60.0	46.0-69.0	52.0-70.0
	2.36 mm	22.0-50.0	28.0-58.0	36.0-65.0
	1.18 mm	12.0-42.0	20.0-50.0	25.0-55.0
	600 μm	6.0-32.0	13.0-40.0	16.0-44.0
	300 μm	3.0-20.0	7.0-27.0	8.0-26.0
	150 μm	2.0-8.0	3.0-10.0	4.0-12.0
	75 μm	2.0-6.0 (B) 2.0-6.5 (HRB)	2.0-6.0	2.0-6.0

Physical Requirements For Asphalt Concrete			
Air Voids %	3.5-4.5	3.5-4.5	3.5-4.5
VMA % (min)	13.5	14.5	15.5
Voids Filled with Asphalt %	65.0-75.0	65.0-75.0	70.0-77.0
TSR (Average of Conditioned & Freeze/Thaw TSR values) %(min) ASTM D4867	75.0	75.0	75.0
Dust to Binder Ratio	0.6-1.2	0.6-1.2	0.6-1.2
Number of Gyrations	Refer to Asphalt Institute Manual Series SP-2		

Physical Requirements For Coarse Aggregate				
Freeze/Thaw % (max)	DOT Method	14.0	12.0	12.0
Micro-Deval %(max)	MTO LS - 618	18.0	15.0	15.0
Petrographic No.(max)*	MTO LS - 609	230	180	180
Flat & Elongated Particle	%(max @4:1) DOT Method	20.0	15.0	15.0
Crushed Particles	DOT Method			
(min % by wt., one face)		95	95	95
(min % by wt., two face)		80	80	80
Absorption %(max)	ASTM C 127	2.00	1.75	1.75
*Note: Not mandatory, the Owner reserves the right to obtain a Petrographic No.				

Physical Requirements For Fine Aggregate				
Micro-Deval % (max)	MTO LS - 619	20.0	16.0	16.0
Uncompacted Void Content %	(min) ASTM C1252	45.0	45.0	45.0

261.2.1.3 .4 Fine aggregate may be produced from pit run gravel by crushing the fraction retained on the 6.3 mm sieve, provided that no more than 5% of the retained material passes the 31.5mm sieve, as determined by ASTM C136 and C117.

.1 Material produced as per 261.2.1.2.4 and passing the 4.75 mm sieve, may be used as fine aggregate.

.5 Fine aggregate may also be accepted or rejected on the basis of past performance.

261.2.1 .4 Blending of Aggregates

.1 Blending of aggregates will be allowed only to meet the grading requirements and/or to increase the percentage of crushed particles.

.2 Blending shall be performed at the asphalt plant cold feed units to produce a consistently graded product.

261.2.1 .5 RAP

.1 If applicable to the Contract:

.1 RAP shall be supplied by the Owner in designated stockpiles or obtained by the Contractor under Item 208.

.2 The Contractor shall be responsible for the incorporation of RAP into the asphalt concrete mix.

.3 RAP shall be free of contamination and shall be processed within 14 Days of the introduction into the cold feed at the plant, in such a manner that all particles pass the 50 mm sieve for HRB, when tested in accordance with ASTM C136.

261.2.1 .6 Blending Sand

.1 Blending sand shall be supplied by the Contractor.

.2 Blending sand shall be used to obtain acceptable physical asphalt concrete mix properties as outlined in Table 261-1.

.3 The maximum mass of blending sand to be used in the total asphalt concrete mix shall not exceed 10% of the total mass.

.4 Blending sand shall have 100.0% passing the 9.5 mm sieve prior to the introduction into the coldfeed at the plant.

261.2.1 .7 Anti-stripping Admixtures

.1 Anti-stripping admixtures shall be supplied by the Contractor.

.1 The requirement for an anti-stripping admixture is determined at the asphalt concrete mix design stage.

.2 The Engineer has approved the anti-stripping admixtures listed in Table 261-2 for use in the Work.

Table 261-2
Approved Anti-stripping Admixtures

Product
Redicote 82-S Redicote C 3082
AD-here LOF 65-00
Pave Bond T Lite
Travcor 4505

261.2.1.7 .2 The type and dosage of all asphalt binder anti-stripping admixtures shall be noted on the delivery slip.

261.2 .2 Composition of Asphalt Concrete Mix

261.2.2 .1 Asphalt Binder Content

.1 For the purpose of establishing the Unit Price for asphalt concrete the Bidder shall assume an asphalt binder content for the asphalt concrete mix as follows:

.1 Asphalt Concrete "B": 5.0% of the total specified tonnage.

.2 Asphalt Concrete "C": 5.7% of the total specified tonnage.

.3 Asphalt Concrete "D": 6.0% of the total specified tonnage.

.4 Asphalt Concrete "HRB": 2.7% of the total specified tonnage.

261.2.2 .2 Mix Design

261.2.2.2 .1 Responsibility for Design Mix Formula

.1 Preparation and submission of the asphalt DMF for the Owner's approval is the responsibility of the Contractor.

  .1 The Contractor shall use professional Engineering services and a qualified testing Laboratory, to assess the aggregate materials proposed for use and to carry out the design of the asphalt concrete mix.

261.2.2.2 .2 Requirements for Design Mix Formula

.1 The asphalt concrete mix design shall follow the Asphalt Institute Manual Series SP-2, Superpave Mix Design. Laboratory compaction of each test specimen will be accomplished by means of a gyratory compactor.

  .1 The asphalt concrete mix design, at the Design Asphalt Content, shall meet the requirements in Table 261-1 for the Asphalt Concrete Mix Type specified.

.2 The amount of RAP in the hot mixed recycled asphalt concrete base mix shall be as specified in the Contract Documents.

261.2.2.2 .3 Approval of Design Mix Formula

.1 All submissions shall include the Contract number.

.2 The material samples shall be tagged and indicate the Contract number, the location of the source, pit/quarry ID number as indicated by the Engineer, the sample location, and the type/size of the material.

.3 The Contractor shall submit the DMF including the following information/materials to the Engineer for approval at a location(s) designated by the Engineer.

  .1 A list of all constituent materials, including aggregate source(s), blending sand source(s), asphalt binder source(s) and anti-stripping admixture source(s).

  .2 The average gradation of each aggregate to be used in the asphalt concrete mix.

  .3 The percentage by mass of each aggregate (including blending sand) to be used in the asphalt concrete mix.

  .4 The asphalt concrete mix design gradation of the combined aggregate (including blending sand).

  .5 Other characteristics of the combined aggregate specified in Table 261-1.

261.2.2.2.3

.6 All Superpave mix design characteristics, including bulk relative density specimen mass, graphs used in arriving at the final asphalt concrete mix design, the bulk relative density of each individual material and the combined aggregates, and the asphalt absorption of the combined aggregates.

.7 Samples of the aggregate: (8)-18 kg samples of coarse aggregate, (10)-18 kg samples of fine aggregate, (2)-18 kg samples of blending sand, and 0.5 L of anti-stripping admixture, if necessary.

.8 A sample of the asphalt binder (4 L/mix).

.9 In order to calibrate the ignition oven, additional samples are required: (3)-18 kg samples of coarse aggregate, (3)-18 kg samples of fine aggregate, (1)-18 kg sample of blending sand, and 3 L/mix of asphalt binder, will be required to be delivered to a lab designated by the Engineer.

.4 The Engineer will require up to 8 Days from the time of receipt of the DMF, for evaluation by the Owner's Laboratory.

  .1 The evaluation period will include verification of the asphalt concrete mix design, moisture sensitivity testing, and verification of the bulk relative densities of the coarse and fine aggregates and blending sand(s).

    .1 In case of discrepancy in the bulk relative density values of the aggregates or blending sand(s), the Engineer's results shall prevail.

.5 If the DMF does not meet the requirements of Table 261-1 it shall be rejected.

  .1 The Engineer shall provide a written explanation to the Contractor that details why the DMF failed.

  .2 The Contractor shall then provide another complete DMF and re-submit it to the Engineer for approval.

.6 The Engineer will not accept any asphalt concrete mix produced prior to the Contractor receiving written approval of the DMF from the Engineer.

.7 Once the DMF has been approved, the Engineer shall prepare samples of the combined aggregates and a sample of the asphalt binder for calibration of the ignition furnace to be used for the quality assurance.

  .1 The Engineer shall deliver the calibration samples to the quality assurance laboratory.

  .2 The Engineer shall complete calibration of the ignition furnace within 3 Days of approval of the DMF.

  .3 Production of asphalt concrete mix shall not start until the ignition furnace has been calibrated for the DMF.

261.2.2.2.3 .8 The Contractor shall be responsible to pay the Owner's associated costs if the Contractor submits for evaluation more than one asphalt concrete mix design per Contract conventional mix designation.

.1 Testing costs incurred by the Owner shall be charged as per DOT Standard Laboratory Rate Schedule.

261.2.2.2 .4 Approval of Job Mix Formula

.1 The Contractor shall submit the JMF to the Engineer for approval. The Contractor's submission shall include the following information:

.1 The percentage by mass of each aggregate (including blending sand) to be used in the asphalt concrete mix.

.2 The percentage by mass passing the 4.75 mm and the 75 μm sieves of the combined aggregates and blending sand

.3 The asphalt binder content as a percentage of the mass of the total mix.

.2 The JMF, when compared to the DMF, shall be within the following limits:

.1 ±5.0% for material passing the 4.75 mm sieve.

.2 ±0.8% for material passing the 75 μm sieve.

.3 ±0.3% for asphalt binder.

.3 The Engineer's written approval of the JMF will allow the Contractor to begin production.

.1 Rejection of the JMF shall require the appropriate action based on the Engineer's assessment.

261.2.2.2 .5 JMF Adjustments During Production

.1 Adjustments to the JMF shall only be made upon approval of the Engineer. In no case will changes to the JMF be accepted during production of the Lot.

.2 The Contractor shall submit a revised DMF in accordance with 261.2.2.2 for a change in source of aggregate used in the asphalt concrete mix.

261.3 SUBMITTALS

.1 The Contractor shall submit, in writing, the proposed source(s) of supply of coarse aggregate and fine aggregate for approval by the Engineer.

.2 The Contractor shall notify the Engineer 3 Days in advance of the commencement of the production of asphalt concrete mix.

261.3 .3 The Contractor shall submit in writing, the proposed supplier of the asphalt binder.

.1 The Contractor shall supply, upon request, a sample of the asphalt binder (2 L/mix) and a sample of any proposed admixture(s), in a volume proportional to the asphalt binder sample.

.2 The Contractor shall supply, upon request, the optimum mixing and compaction temperature, for PG asphalt binders.

.3 The Contractor shall submit at the time of delivery to the plant the refinery certification and delivery slip for each tanker load of asphalt binder.

.4 If the source of supply of the asphalt binder changes during the Work, the Contractor shall submit in writing, this proposed change prior to using the new asphalt binder supply in the Work.

.5 Other submittals are required for this Item and are contained within the sections applicable to the specific phase of the Work being undertaken.

.6 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

261.4 CONSTRUCTION

261.4 .1 General

261.4.1 .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

261.4 .2 Equipment

261.4.2 .1 General

.1 Equipment shall be designed and operated to produce an end product complying with the requirements of this Specification.

.2 Equipment used shall be of adequate rated capacity and shall be in good working order.

261.4.2 .2 Field Laboratory

.1 The Contractor shall provide an area for the Owners' lab trailer adjacent to the plant with vehicle access, power and an adequate supply of water (minimum 10 L/min) that is clean and free of injurious amounts of oil, alkali, acid, organic matter or other deleterious substances, for the duration of the Work.

.1 The Contractor shall retain a qualified electrician to perform the electrical hook-up to Conform to the requirements of the Canadian Electrical Code.

261.4.2 .3 Mixing Plant

.1 The asphalt mixing plant and its' components shall meet the requirements of ASTM D 995 and the Contract Documents.

261.4.2 .4 Placing Equipment

.1 Mechanical self-powered pavers shall be capable of spreading mixture true to line, grade and cross-Slope.

.2 Pavers shall be equipped with hoppers and distributing screws to place mixture evenly in front of the screeds.

.3 Pavers shall be equipped with vibrating screeds and shall be capable of spreading mixtures, without segregation and with a smooth and uniform textured surface, to the required thickness and in widths from 3 m to 5 m.

    .1 Screeds shall be equipped with heaters which are capable of preheating the entire screed and screed extensions.

.4 The Contractor shall provide a 3 m straight edge with each paver.

.5 Pavers shall be equipped with automatic screed controls for the control of longitudinal grade and transverse Slope.

    .1 The longitudinal grade control shall be equipped to operate from either side of the paver and be capable of providing longitudinal grade control as well as matching longitudinal joints.

    .2 The transverse Slope control shall also be capable of operating from either side of the paver.

    .3 The Contractor shall use a minimum 12 m ski/floating beam or an approved equivalent for longitudinal grade control.

        .1 A joint matching shoe may be used to control longitudinal grade of subsequent mats placed adjacent to the original mat.

    .4 A calibrated Slope indicator shall be installed in a readily visible location on each paver.

.6 Longitudinal grade control shall be used on all lifts and transverse Slope controls shall be used on all lifts except surface course unless otherwise directed by the Engineer.

.7 Vibrating hydraulic screed extensions and vibrating bolt-on screed extensions shall be used in placing mat widths greater than 3 m.

    .1 Hydraulic strike-off extensions are only acceptable when laying mats of irregular widths outside of the driving Lanes.

261.4.2 .5 Compaction Equipment

.1 Compaction Equipment shall consist of at least one of each of the following:

.1 Vibratory roller.

.2 Pneumatic-tired roller.

.1 A combination steel-drum vibratory/pneumatic tire roller may be used in place of the vibratory and pneumatic rollers.

.3 Steel-drum tandem finish roller.

.2 All rollers with rubber tires shall be equipped with a means to prevent the asphalt mix from adhering to the rubber tires.

.1 Hydrocarbon fuels or solvents shall not be used.

261.4.2 .6 Material Transfer Vehicle (MTV)

.1 Material transfer vehicles shall be self-propelled equipment capable of transferring asphalt concrete from the hauling equipment into the paver, and shall have the following characteristics:

.1 Minimum storage capacity of 20 t;

.2 A conveyor system to transfer asphalt concrete from the hauling equipment to the paver hopper insert; and

.3 An auger system in the MTV or paddle mixers in the hopper insert to remix the asphalt concrete prior to discharge from the hopper insert.

.2 The Contractor has the option of using a material transfer vehicle for the placement of all asphalt concrete, with compensation per 261.5.4 herein.

261.4 .3 Production and Placement of Asphalt Concrete Mix

261.4.3 .1 Production of Mix

.1 Asphalt concrete shall be produced to meet the requirements of Table 261-4.

261.4.3 .2 Trial Mix

.1 Trial mixes are the property of the Contractor and shall be placed outside the Work Site, unless otherwise authorized by the Engineer for the purpose of padding or patching.

261.4.3 .3 Mixing and Temperatures

.1 Mixing temperature for all types of plants shall be such that the temperature of the asphalt concrete mix when discharged from the mixer unit shall be controlled within ± 5°C of the temperature requirement of the DMF, unless otherwise authorized by the Engineer.

  .1 The minimum mixing temperature shall be 115°C.

  .2 The maximum mixing temperature shall be 165°C or the temperature recommended by the asphalt binder supplier.

.2 The heating of the asphalt mix shall be controlled to prevent the fracture of the aggregate and damage to the asphalt binder.

  .1 The system shall be equipped with automatic burner controls and shall provide a printed record of the mix temperature at discharge.

  .2 The asphalt binder recovered by extraction from the asphalt mix shall meet the requirements of the Pressure Aging Vessel (PAV) as specified in AASHTO M320, Table 1 - Performance Graded Asphalt Binder Specification.

.3 Overnight storage in silos will not be permitted.

.4 Reclaimed asphalt concrete shall not be exposed to direct flame during and/or after introduction into the plant.

.5 Moisture Content:

  .1 The maximum moisture content allowed in the asphalt concrete mix as it is discharged to the surge bin, storage silo or pug mill shall be 0.15%.

  .2 The aggregate shall be dried sufficiently so that visual evidence of moisture, such as but not limited to the presence of foaming, slumping or stripping of the mix, does not occur.

261.4.3 .4 Transportation of Asphalt Concrete

.1 Trucks for transporting asphalt concrete shall have tight, metal boxes free of foreign materials.

.2 Loads shall be covered with tarpaulins of sufficient size to overhang the fully loaded truck boxes and be tied down on three sides and the front shall be tight to the box of the truck or shielded to prevent air infiltration.

.3 Truck boxes may be lightly lubricated with an environmentally acceptable release agent, as required, but must be raised and drained after each application and before loading.

  .1 Hydrocarbon fuels or solvents shall not be used.

.4 Tarpaulins shall be rolled back and the hot asphalt concrete shall be uncovered immediately prior to dumping the load into the paver.

261.4.3 .5 Timing of Paving Operations

.1 Paving operations shall not commence in the spring until the DOT weight restrictions are lifted or continue after the dates specified in Table 261-3 without written permission of the Engineer.

Table 261-3
Cut-off Dates for Paving

County	Surface mixes	Base mixes
Gloucester, Madawaska, Restigouche, Victoria	September 30	October 15
All others	October 15	October 31

261.4.3.5 .2 Paving operations shall only be conducted during the Daylight hours unless specifically altered by written approval of the Engineer.

.3 The placement of the new asphalt concrete mix shall take place within 7 Days of the commencement of the cold milling operation.

.4 When the RAP is being reused in a recycled asphalt concrete mix, the placement of the asphalt concrete shall commence within 21 Days of the availability of the RAP required to carry out an asphalt concrete mix design.

261.4.3 .6 Placing Asphalt Concrete

.1 The Contractor shall place asphalt concrete on a dry surface.

  .1 Asphalt concrete shall not be placed under adverse weather conditions of precipitation.

  .2 When placing asphalt concrete surface mix, the surface temperature of the material to be overlaid shall be a minimum of 5 °C.

.2 When paving on Aggregate Base, the Aggregate Base must be free from standing water.

.3 All prepared surfaces shall be cleaned of loose or foreign material prior to placing of the asphalt concrete.

  .1 Milled and aged asphalt concrete surfaces shall be treated with bituminous tack coat in accordance with Item 259 prior to the placing of asphalt concrete.

.4 Existing approaches to railway crossings and Bridge Structures, or areas adjacent to paved surfaces or other Structures, shall be removed to the depths shown on the Contract Documents or as directed by the Engineer.

  .1 The removed material shall be disposed of and the exposed surfaces shall be prepared as identified in the Contract Documents or as directed by the Engineer.

261.4.3.6 .5 Contact edges of existing mats and contact faces of curbs, gutters, manholes, Sidewalks and Bridge Structures shall receive an application of tack before placing the asphalt concrete.

.6 The temperature of the asphalt concrete shall be a minimum of 115 °C prior to initial compaction.

.7 The maximum temperature of the asphalt concrete shall be 165 °C or the temperature recommended by the asphalt binder supplier.

.8 When laying base and/or surface course the alignment of the paver shall be controlled by a standard method, such as following a stringline, placed by the Contractor from an alignment designated by the Engineer.

.9 Irregularities in alignment and grade along the outside edge of the asphalt concrete shall be corrected by the addition or removal of asphalt concrete before the edge is rolled.

.10 The cross slope of the asphalt concrete surface shall be within ± 0.5 % (± 15 mm when measured over 3 m, perpendicular to the centreline) of the cross slope specified in the Contract Documents or provided by the Engineer.

.11 In narrow base widening, deep or irregular sections, intersections, turn-outs or driveways where it is impractical to spread and finish asphalt concrete by machine methods, the asphalt concrete shall be spread by hand in accordance with standard hand placement practices.

.12 Paving of intersections, extra widths and other variations from standard Lane alignment and as defined in the Contract Documents, whether by hand spreading or machine laying, shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Engineer.

  .1 Driveway entrances and aprons shall be paved concurrently or after the machine laying operation of the regular mat.

.13 Spreading of asphalt concrete by hand shall be kept to a minimum and shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Engineer.

.14 Adjacent asphalt concrete mats, including those placed on shoulders, shall be completed to approximately the same location at the end of each day's paving.

.15 For ESAL counts equal to or greater than 3 million, no traffic shall be permitted on newly placed asphalt concrete until finish rolling is complete, and the finished mat has been permitted to cool to 60°C.

  .1 Water required to lower the mat temperature shall be supplied in accordance with Item 191.

.16 Damage to the mat as a result of contaminant spills from the Contractor's Equipment shall be immediately repaired by the Contractor to the satisfaction of the Engineer.

261.4.3.6 .17 All placement, spreading, compacting and rolling shall occur only during daylight hours, and any loads arriving at the Work Site such that these requirements cannot be met shall be rejected by the Engineer.

261.4.3 .7 Padding

.1 Padding will be included as part of a Lot.

.1 Material for padding shall be the same asphalt concrete mix designation as specified in the Contract Documents.

.2 Asphalt concrete for padding shall be placed by means of a self-powered paver or by other methods approved by the Engineer.

.3 The compaction Equipment shall be in accordance with 261.4.2.5.

.1 For padding, 261.4.5.2, 261.4.5.4 and 261.4.5.6 shall not apply.

.2 The Contractor shall establish a rolling pattern to achieve the maximum compaction of the asphalt concrete used for padding.

.4 Padding is intended to be a separate operation and shall not be done as part of the construction of the subsequent lift of asphalt concrete.

261.4.3 .8 Joints

261.4.3.8 .1 General

.1 Joints shall be constructed to ensure thorough and continuous bond and to provide a smooth riding surface.

.2 Dirt or other foreign and loose material shall be removed from the faces against which joints are to be made.

.3 The Contractor shall remove and dispose of waste materials, resulting from joint construction or other Work activity, outside the Work Site before the end of each week.

261.4.3.8 .2 Transverse Construction Joint

.1 A Transverse Construction Joint shall be constructed at the end of each Day's Work and at other times when paving is halted for a period of time which will permit the asphalt concrete to cool below 115°C.

.2 Where the asphalt concrete surface and/or base course has been terminated due to the conditions noted in 261.4.3.8.2.1, a smooth 1.5m long taper shall be paved.

.3 When paving resumes, tapers from surface courses previously laid shall be cut back to full mat thickness to expose fresh, straight vertical surfaces, free from broken or loose material and tacked in accordance with 259.2, 259.3 and 259.4.

261.4.3.8 .3 Transverse Key Joint

.1 A transverse key joint shall be constructed as per Standard Drawing 260-1 between the existing and new asphalt concrete Pavement at the beginning and at the end of the project and other locations where the new Pavement terminates against an existing Pavement.

.2 If a transverse key is cut in advance of paving the joint area, the Contractor shall immediately construct with hot mixed asphalt concrete a smooth 1.5 m long taper at the joint area, as shown in Standard Drawing 260-1.

.3 Prior to the placement of the asphalt mix, all transverse key joint surfaces shall be cleaned of loose foreign material and a tack coat applied in accordance with 259.2, 259.3 and 259.4.

261.4.3.8 .4 Longitudinal Construction Joint

.1 The following requirements shall apply when constructing longitudinal joints.

  .1 Widths of succeeding individual courses shall be offset by 50 -100 mm.

  .2 Contractors using a one paver operation between May 15th and September 15th may leave an exposed longitudinal joint for up to one-half of the Days production without an application of tack coat unless otherwise directed by the Engineer.

    .1 Before May 15th and after September 15th the Contractor shall be required to tack the longitudinal joint in accordance with 259.2, 259.3 and 259.4.

  .3 All longitudinal joints left exposed overnight or which are exposed to moisture shall receive an application of tack coat in accordance with 259.2, 259.3 and 259.4.

  .4 Longitudinal joints shall not be permitted between the edges of driving Lanes in the final lift of asphalt concrete.

  .5 Longitudinal joints shall be constructed to ensure that maximum compression under rolling is achieved.

  .6 On surface courses, the method of making joints shall be such that excess material is not scattered on the surface of the freshly laid mat and all excess material shall be carefully removed.

261.4.3 .9 Compaction of Asphalt Concrete

.1 If damage to Highway components and/or adjacent property is occurring while using vibratory compaction Equipment, the Contractor shall immediately cease using this Equipment and proceed with the Work using static rolling Equipment.

261.4.3.9 .2 Along curbs, manholes and similar Structures and places not accessible to full size rollers, the mixture shall be compacted with either smaller compactive Equipment, such as vibrating plate tampers, or by hand tampers.

261.4.3 .10 Additional Requirements for Bridge Deck Paving

.1 The Contractor shall place asphalt concrete on the deck waterproofing system in accordance with the waterproofing manufacturer's recommendation and/or procedures.

.2 The Contractor shall be responsible for all damage to the waterproofing membrane resulting from any aspect of the paving operation.

  .1 Should the membrane become damaged, paving operations shall be immediately stopped and repairs made, in accordance with the manufacturer's instructions, before paving recommences.

.3 Expansion joints and deck drains shall be protected from damage from Equipment passing over them.

  .1 The placing of the asphalt concrete at expansion joints shall be completed as indicated on Standard Drawing 260-2.

.4 The Contractor shall submit a rolling pattern for the approval of the Engineer.

.5 A steel-drum tandem roller, operating in the non-vibratory mode and exerting a contact pressure on compression roll of at least 3.0 kg/mm of drum width shall be the breakdown roller required for Bridge deck paving.

.6 The breakdown roller shall be required to run off the deck to stop and turn.

.7 After breakdown rolling, the mat shall be rolled with a pneumatic tired roller, taking care not to displace the mat when stopping or turning.

.8 The mat shall be finish rolled to remove any marks.

.9 For Bridge decks, 261.4.5.2, 261.4.5.4 and 261.4.5.6 shall not apply.

261.4.3 .11 Temporary Pavement Markings

.1 The Owner will supply temporary Pavement markings to the Contractor in the form of marking strips or raised markers, for placement as temporary centreline, laneline or edgeline delineation.

.2 Temporary markings shall not placed on the chip seal surface.

.3 The raised markers shall not be used to delineate centreline except on milled surfaces.

.4 On new or milled Pavement exposed to traffic, the temporary markings shall be placed on the same day as the paving or milling.

261.4.3.11 .5 Markings shall be strips 2 m long, or groups of three raised markers equally spaced over a 2 m length, oriented longitudinally and placed every 50 m on tangents and 25 m on horizontal and vertical curves.

.6 The Contractor shall replace damaged or missing markings at the end of the day.

261.4 .4 Quality Control Testing

261.4.4 .1 General

.1 The Contractor shall be totally responsible for quality control testing throughout every stage of the Work from the crushing and production of aggregates to the final accepted product, to ensure materials and workmanship conform with the requirements of this Specification.

261.4.4 .2 Inspection Testing Plan (ITP)

.1 The Contractor shall submit, in writing to the Engineer, an ITP covering all phases of the Contract performance and the name of the party retained to conduct the ITP, within ten Days after the Contract award.

.2 The ITP shall include, but not be limited to, identification and description of inspection and required test procedures to be used during the entire life of the Contract.

.3 The ITP shall be sufficiently comprehensive and detailed to assure the Engineer of the Contractor's willingness and ability to control the construction production and processes.

.4 Once accepted by the Engineer the plan becomes a part of the Contract and shall be enforced accordingly.

.5 The ITP may have to be updated and revised, by the Contractor, as conditions warrant.

261.4.4 .3 Sampling and Test Results

.1 Where specified, random sampling procedures shall be followed, and where no specific random sampling procedure is specified the sampling procedure shall be as identified by the Contractor.

.2 The Contractor shall be responsible for the interpretation of the test results and the determination of any action to be taken to ensure that all materials and Work Conform to the requirements of the Contract.

.3 At no time will the Engineer issue instructions to the Contractor as to setting of dials, gauges, scales and meters.

  .1 However, the Engineer may advise the Contractor against the continuance of any operations or sequence of operations which will result in non-compliance with Specification requirements.

261.4.4.3 .4 The Contractor shall maintain records of all inspection and tests.

.1 Results of all quality control tests shall be available for examination by the Engineer at all times and copies shall be provided to the Engineer on a daily basis.

261.4 .5 Quality Assurance Testing and Adjustments

261.4.5 .1 General

.1 The Contractor shall provide an end product Conforming in quality and accuracy of detail to the dimensional and tolerance requirements of the Plans and Specifications.

.1 While the Contractor shall be fully and exclusively responsible for producing the end product, acceptance testing is the responsibility of the Engineer.

.2 Certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied.

.1 The Engineer shall test for compliance with these requirements as described in 261.4.5.

.2 The test methods indicated in Table 261-4 will be used to determine material characteristics.

Table 261-4
Test Methods

Test Description		Test Method
Sampling Mixes		ASTM D 979
Coring		ASTM D 5361
Ignition Method		DOT Asphalt Plant Technician Certification Manual, Procedure # 9
Percent Fracture		DOT Method
Sieve Analysis		ASTM C 136/ASTM C 117
Bulk Relative Density		ASTM D 2726
Theoretical Maximum Relative Density		AASHTO T209
Voids Calculations, Asphalt Concrete Specimens		ASTM D 3203
Percent Compaction, Asphalt Concrete Pavement		ASTM D 2726
Forming Superpave Specimens, Field Method		AASHTO T 312
Moisture Content, Oven Method Asphalt Concrete Mix		ASTM D 2172
Smoothness of Pavements, Profiler Method		ASTM E 950
Stratified Random Test Sites for A.C.P. Projects		ASTM D 3665
Appeal Testing		as outlined in Specifications
Asphalt Binder:	Flash and Fire Points	AASHTO T 48 or ASTM D 92
	Viscosity	AASHTO T316 or ASTM D 4402
	Rheological Properties	AASHTO T315
	Rolling Thin Film Oven	AASHTO T 240
	Accelerated Aging (PAV)	AASHTO R28
	Flexible Creep Stiffness	AASHTO T313
TSR (Average of Conditioned & Freeze/Thaw TSR values)		ASTM D 4867
In all test methods used as reference in this specification, metric sieves as specified in ASTM E11 shall be substituted for any other specified wire cloth sieves.		

261.4.5.1 .3 The Engineer reserves the right to inspect and/or test any of the Contractor's operations or materials and those of subcontractors and suppliers, regardless of location.

  .1 Such inspections and tests shall not relieve the Contractor of his responsibilities to control quality.

  .2 The Engineer's approval of any materials or mixture shall in no way relieve the Contractor from his obligation to provide materials, mixtures and workmanship in accordance with the Specifications.

.4 The loose and core samples shall be taken by the Contractor in the presence of the Engineer.

  .1 The random locations shall be determined by the Engineer.

  .2 The Engineer will be responsible for the labelling, storing, and transporting of the loose samples to the Owner's laboratories.

  .3 The Engineer shall be responsible for labelling the cores.

  .4 The Contractor shall be responsible for the storage and transportation of the cores to the Owner's Laboratory, within 2 hours of coring, for testing.

  .5 The Contractor shall reinstate the Pavement at each core sample location in conjunction with removal of the core by dewatering the core hole and filling it with hot mixed asphalt concrete in 50 mm lifts to the Pavement surface elevation, compacting each lift with 25 blows using a standard compaction device.

.5 The Engineer will provide the Contractor with a copy of the results of acceptance tests within one working Day of their availability.

.6 Acceptance test results for a given Lot will not be reported to the Contractor until the quality control results for that Lot have been reported to the Engineer.

.7 If any one of the control characteristics of a Lot is outside the acceptance limits as listed in Table 261-5, then the Lot will be rejected automatically regardless of the values of the other control characteristics.

.8 Tests performed by the Engineer will not be considered to be quality control tests.

.9 Random sampling methods will not be applied to the following areas:

  .1 Areas of obvious surface defects as indicated in 261.4.5.7, which shall be marked and repaired in accordance with 261.4.5.9.2.

  .2 Small areas such as tapers, aprons, Bridge approaches, gores and areas of handwork, and asphalt mix used for isolated levelling and repair of failed areas.

261.4.5.1 .10 The procedure for dealing with an outlier test result shall be as follows:

.1 When an individual test result from a Lot is questionable, the validity of the test result in question will be determined in accordance with ASTM E 178, Standard Practice for Dealing with Outlying Observations using a "t" test at a 5 percent significance level.

.2 If the outlier test procedure shows that the challenged test result is valid then the test result will be used in the calculations.

261.4.5 .2 Asphalt Density

.1 Compaction testing shall be based on a Lot average method.

.2 Pavement samples will be taken on the road by coring using stratified random sampling procedures. Five tests per Lot will be selected as follows.

.1 The Lot will be divided into 5 segments of approximately equal length.

.2 In each segment a test site will be located by using random numbers to determine the longitudinal distance from the end of the segment and the lateral distance from the edge of the segment.

.3 In no case will a lateral distance be less than 0.3 m from the edge of a mat.

.4 Cores shall not be taken in the Shoulder area where only a single lift of asphalt concrete surface mix is placed, for which the Contractor shall establish a rolling pattern to achieve the maximum compaction of the asphalt concrete.

.5 Cores will not be taken within 25 m of a loose sample location.

.6 Cores shall be obtained in accordance with ASTM D5361, within a minimum of 12 hours and a maximum of 24 hours after the placement of the Lot.

.1 The maximum may be extended to 72 hours in order to exclude Saturday and Sunday unless the Contractor is placing asphalt concrete on either Day.

.3 The percent compaction of a Lot will be determined by comparing the average of the core densities with the average of the Theoretical Maximum Relative Density of the loose samples.

261.4.5 .3 Asphalt Content, Gradation and Air Voids

.1 Loose samples will be taken on the road behind the paver before compaction, with 3 samples per Lot selected as follows:

.1 A Lot will be divided into 3 segments of approximately equal quantity.

.2 For each segment random numbers will be used to determine the tonnage at which to obtain the sample.

261.4.5.3.1 .3 Each sample will be split in two equal portions, one portion will be tested, and the other will be set aside in the event that an appeal is requested by the Contractor.

.2 If the plant production is 800 t or less, one additional random loose sample will be obtained, and the production will be added to the previous Lot.

261.4.5 .4 Smoothness

.1 General

.1 The Profile requirements shall be specified in the Contract Documents.

.2 The smoothness of the final lift of newly placed asphalt concrete Pavement will be checked with a High Speed Profiler as soon as possible after final rolling.

.3 The profile will be checked along the traffic wheel paths in accordance with ASTM E 950.

.4 The Profile Index (smoothness) for each Lane is the cumulative Profile reading of the outer wheel path in millimetres per 100 m section, in excess of the 5 mm blanking band.

261.4.5.4 .2 Full Profile Requirement

.1 The final lift of Pavement shall conform to the Profile Index requirements indicated in Table 261-9.

.2 Pavement sections with a Profile Index outside of those indicated as Full Payment in Table 261-9 will be subject to payment adjustment as described in 261.5.3 or repair in accordance with 261.4.5.9.4.

.3 For individual bumps/dips exceeding 8.5 mm, 261.4.5.4.3.1 will apply.

261.4.5.4 .3 Bump/Dip Profile Requirement

.1 Individual bumps/dips exceeding 8.5 mm as detected by the profiler will be subject to payment adjustment as described in 261.5.3 or the Contractor may opt to repair these bumps/dips in accordance with 261.4.5.9.4.

.2 The Bump/Dip profile requirements shall apply to interchange ramps.

261.4.5 .5 Asphalt Binder

.1 Asphalt binder samples shall be obtained and packaged as follows:

.1 Samples shall be a minimum size of one litre and shall be taken from the Contractor's storage tank in accordance with ASTM D 140.

.1 The sample containers shall be supplied by the Engineer.

261.4.5.1 .2 The Contractor shall obtain one asphalt binder sample per 5000 t of asphalt concrete mix production, taken in accordance with ASTM D140 from the Contractor's asphalt binder storage tank(s).

.3 The Engineer shall label the samples with the Contract number, date, time, grade and type of asphalt binder, supplier, refinery, and the name and the proportions of any additives added to the asphalt binder.

.4 If a sample test result falls outside of the material requirements specified in 261.2.1.1, the Engineer may require that the Contractor suspend the asphalt concrete mix production.

  .1 Compliance shall be verified by the Engineer before the asphalt concrete mix production is allowed to continue.

261.4.5 .6 Thickness

.1 The Contractor shall place the asphalt concrete in lifts at the thickness indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Thickness shall be evaluated on a Lot by Lot basis.

.3 The Pavement Thickness shall be determined from the test results of the cores obtained according to 261.4.5.2.

  .1 If the Thickness does not meet the requirements of Table 261-5 then the deficient area shall be repaired as indicated in 261.4.5.9.

Table 261-5
Acceptance/Rejection Requirements by Lot

Measurement	Types of Mix (& Sieve Size)	Lot Payment			Repair / Replace Reject
		Increased	Full	Reduced	
Bulk Relative Density as (%) of Theoretical Maximum Relative Density (%)	All	> 92.5	92.5	92.4 – 89.5	< 89.5
Asphalt Content (%) (Mean of Deviations of Lot from JMF)	B, HRB C, D	N.A. N.A.	0.0 – 0.4 0.0 – 0.3	0.41 – 0.65 0.31 – 0.50	> 0.65 > 0.50
Gradation (%) (Mean of Deviations of Lot from JMF)	B, HRB: (4.75 mm) (75 μm)	N.A. N.A.	0.0 – 6.0 0.0 – 0.8	6.1 – 10.0 0.9 – 1.5	> 10.0 > 1.5
(See Note 1)	C, D: (4.75 mm) (75 μm)	N.A. N.A.	0.0 – 5.0 0.0 – 0.5	5.1 – 9.0 0.6 – 1.2	> 9.0 > 1.2
Cores with Thickness Within Tolerance (#) (See Note 2)	All	N.A.	4 of 5	N.A.	3 of 5
Air Voids (%) Mean of Deviations from Target Value of 4.0%	All	N.A.	1.00	1.05 - 2.0	> 2.0

NOTE 1 (Additional Requirements for Gradation):

a) If the average of Lot test results for the 4.75 mm sieve size falls outside the gradation limits of Table 261-1, the Lot will be rejected.

b) If the average of Lot test results for the 75 μm sieve size exceeds the upper gradation limit of Table 261-1, the following will apply:
- Exceeds by ≤ 1.0%, the Lot Payment will be reduced by $5.00/t;
- Exceeds by > 1.0%, the Lot will be rejected.

NOTE 2 (Thickness):

a) Thickness = specified application rate ÷ bulk relative density obtained from core samples.

b) Lift Thickness Tolerance by Type of Mix
- Tolerance = 0.80 x Specified Thickness (HRB)
- Tolerance = 0.85 x Specified Thickness (B, C, D)

c) If the thickness of either lift of base mix is less than the tolerance, the Contractor shall place the next lift of asphalt concrete to achieve a thickness equivalent to the total thickness of the two lifts as specified in the Contract. The total thickness of the two lifts for the deficient Lot shall be verified by coring the two lifts in the area of the deficient Lot.

261.4.5 .7 Surface Defects

.1 The finished surface of any Pavement course shall have a uniform texture and be free of visible signs of poor workmanship and bumps and/or dips exceeding 3mm as measured with a 3 m straight edge.

.2 Any obvious defects, as determined by the Engineer, will be cause for rejection of the Pavement course.

.3 Such defects shall include but not necessarily be limited to the following:

  .1 Segregated areas.

  .2 Areas of excess or insufficient asphalt binder.

  .3 Roller marks.

  .4 Cracking or tearing.

  .5 Improper matching of longitudinal and transverse joints.

  .6 Tire marks.

  .7 Sampling locations not properly reinstated.

  .8 Improperly constructed patches.

  .9 Contaminant spills on the mat.

  .10 Flushed Areas

261.4.5 .8 Appeal of Lot Test Results

.1 The Contractor may appeal the results of acceptance testing of the density, asphalt content, gradation and thickness for any rejected or penalized Lot only once.

.2 Appeals shall only be considered for all tests within the Lot.

.3 Any attempt to improve density on the appealed Lot after the Engineer has tested the Lot for acceptance shall void the appeal and the original test results will apply.

.4 The following procedures will apply for an appeal:

  .1 The Contractor shall serve notice of appeal to the Engineer, in writing, within 48 hours of receipt of the test results.

  .2 The Contractor and the Engineer shall agree on a time at which the cores for the appeal of the Lot will be taken.

    .1 The cores for the appeal of the Lot shall be taken within 48 hours of the submission of the notice for the appeal.

261.4.5.8.4 .3 If the density or thickness of the Lot is appealed the Contractor shall take 5 more cores at random locations as determined by the Engineer. These cores will be tested by the Owner.

.4 If the asphalt content, gradation or air voids is appealed the Engineer will take the remaining portion of the samples obtained in 261.4.5.3 and test them at the Owner's Laboratory.

.5 The Contractor may have a representative present during the period of the testing; the Contractor's representative shall comment on anything concerning the testing which he does not consider to be valid and the Engineer shall respond to all comments in order to resolve them.

  .1 Prior to leaving the testing Laboratory any unresolved comments regarding the testing procedures are to be given to the Engineer in writing.

  .2 Any comments, with respect to the testing procedures, which are made subsequent to the Contractor's representative leaving the Laboratory, will not be considered.

.6 The test results from the original Lot will be combined with the test results of the new samples.

  .1 A new Sample Mean or the Mean of the Deviations for the combined test results will be determined and this value will be used for acceptance and Unit Price adjustment.

  .2 For thickness appeals 7 of the 10 test results must meet or exceed the lift thickness tolerance specified in Table 261-5.

  .3 The new Lot test results so obtained shall be binding on both the Contractor and the Owner.

261.4.5 .9 Repairs

261.4.5.9 .1 General

.1 Repairs to the Work to improve smoothness shall be carried out in accordance with this Item and within 30 Days from the time the Contractor receives the Engineer's written assessment of the Work, but in no case later than October 15th of the year that the asphalt concrete was placed.

.2 Repairs to correct surface defects shall be carried out in accordance with this Item within one year from the time the Contractor completes placement of the asphalt concrete.

.3 The asphalt concrete used for replacement or overlay to correct surface defects shall be the same asphalt concrete mix designation as that which is removed or overlaid.

  .1 Any asphalt concrete which does not conform to the requirements of this Item shall not be incorporated in the Work.

261.4.5.9.1 .4 Repairs required in accordance with 261.4.5.4 shall be carried out for the full width of the driving Lane.

261.4.5.9 .2 Removal and Replacement

.1 The full thickness of the appropriate lift of Pavement in the rejected Lot shall be removed by cold milling or other means as approved by the Engineer.

.2 All joints shall be tack-coated.

.3 Repaired areas will be retested for acceptance; those failing will be rejected and shall require further repair.

.4 Material removed shall become the property of the Contractor, who shall dispose of the material outside the Work Site.

261.4.5.9 .3 Overlaying

.1 The overlay shall extend the full width of the underlying Pavement surface and have a finished compacted thickness of not less than 50 mm for a base course and 40 mm for a surface course.

.2 A key shall be constructed at each end of the overlaid section as per Standard Drawing 260-1.

.3 If an overlay results in the need for repairs or adjustments to the adjacent materials within the Work Area, the Contractor shall carry out the repairs and adjustments at his own expense and to the satisfaction of the Engineer.

.4 Repaired areas will be retested for acceptance.

  .1 Those failing will be rejected and a second overlay will not be permitted.

  .2 The Contractor shall then carry out repairs in accordance with 261.4.5.9.2.

  .3 Removal depth shall be sufficient to remove the full thickness of the overlay lift and the original unsatisfactory surface lift.

261.4.5.9 .4 Rolling

.1 Rolling of bumps/dips to repair smoothness deficiencies will be permitted.

  .1 Neither 261.4.5.9.2 nor 260.4.5.9.3 will be permitted to repair smoothness deficiencies.

.2 Should excessive damage occur to the asphalt concrete mat due to rolling, the Contractor shall remove and replace the damaged area as per 261.4.5.9.2.

261.5 MEASUREMENT FOR PAYMENT

261.5 .1 General

.1 The Quantity to be measured for payment shall be the number of tonnes of asphalt concrete placed, in accordance with this Item, subject to payment adjustments.

  .1 The Quantity of asphalt concrete for a Lot shall not exceed that calculated as follows:

$$[1.10 \times (\text{application rate}) \times (\text{length}) \times (\text{specified width})] \div 1000$$

261.5 .2 Unit Price Adjustment (UPA) of the Lot

.1 The UPAs for asphalt concrete are as shown in Tables 261-6, 261-7, 261-8 and 261-11.

.2 For asphalt concrete placed as padding, on Shoulder areas where a single lift of asphalt concrete surface mix over granulars is specified and on Bridge decks, the UPA as shown in Table 261-6 shall not apply.

.3 If repairs are carried out by removal and replacement or overlay of the asphalt concrete, the UPA for the Lot will be based on quality assurance testing carried out on the repaired Lot.

.4 The Unit Price (UP) for asphalt concrete base or surface mixes will be adjusted for each Lot as follows:

$$UP_{Lot} = UP + \Sigma\,(UPA_{Density} + UPA_{Asphalt\ Content} + UPA_{Gradation} + UPA_{Air\ Voids})$$

261.5 .3 Payment Adjustment for Smoothness

.1 The payment adjustment for smoothness shall be as shown in Table 261-8.

.2 Individual bumps and dips shall be assessed in accordance with the schedule set out in Table 261-10.

.3 Penalty or bonus assessments for Profile Index readings shown in Table 261-8 and the bump and dip penalties shown in Table 261-9 will be based on test results following the Contractor's final corrective efforts.

.4 For asphalt concrete placed on Bridge decks, the payment adjustments as shown in Tables 261-9 and Table 261-10 shall not apply.

.5 The payment adjustment for smoothness will apply only to the Quantity of asphalt concrete in the final lift within the driving Lanes, as calculated using the application rate as specified in the Contract Documents or as specified by the Engineer.

Table 261-6
Unit Price Adjustment For Density (UPAd)

% of Theoretical Maximum Relative Density (Lot Average)	Unit Price Adjustment ($ per Tonne)
93.0	+1.00
92.9	+0.80
92.8	+0.60
92.7	+0.40
92.6	+0.20
92.5	0.00
92.4	-0.20
92.3	-0.40
92.2	-0.60
92.1	-0.80
92.0	-1.00
91.9	-1.20
91.8	-1.40
91.7	-1.60
91.6	-1.80
91.5	-2.00
91.4	-2.20
91.3	-2.40
91.2	-2.60
91.1	-2.80
91.0	-3.00
90.9	-3.40
90.8	-3.80
90.7	-4.20
90.6	-4.60
90.5	-5.00
90.4	-5.40
90.3	-5.80
90.2	-6.20
90.1	-6.60
90.0	-7.00
89.9	-8.00
89.8	-9.00
89.7	-10.00
89.6	-11.00
89.5	-12.00
<89.5	reject

Table 261-7
Unit Price Adjustment For Asphalt Content (UPAa)

Mean of the Deviations of Actual Asphalt Content From the Approved Asphalt Content		Unit Price adjustment for Asphalt Content ($ per Tonne)
Type B/HRB	0.00 to 0.40	0.00
	0.41 to 0.45	-1.00
	0.46 to 0.50	-2.00
	0.51 to 0.55	-3.00
	0.56 to 0.60	-4.00
	0.61 to 0.65	-5.00
	> 0.65	reject
Type C/D	0.00 to 0.30	0.00
	0.31 to 0.35	-1.00
	0.36 to 0.40	-2.00
	0.41 to 0.45	-3.00
	0.46 to 0.50	-4.00
	> 0.50	reject

Table 261-8
Unit Price Adjustment For Gradation (UPAg)

Sieve Size ASTM Designation	Mean of the Deviations of the Gradation from the JMF		Unit Price Adjustment for Gradation
	Type B/HRB	Type C/D	$ per Tonne
4.75 mm	0.0 to 6.0	0.0 to 5.0	0.00
	6.1 to 6.2	5.1 to 5.2	-0.50
	6.3 to 6.4	5.3 to 5.4	-1.00
	6.5 to 6.6	5.5 to 5.6	-1.50
	6.7 to 6.8	5.7 to 5.8	-2.00
	6.9 to 7.0	5.9 to 6.0	-2.50
	7.1 to 7.2	6.1 to 6.2	-3.00
	7.3 to 7.4	6.3 to 6.4	-3.50
	7.5 to 7.6	6.5 to 6.6	-4.00
	7.7 to 7.8	6.7 to 6.8	-4.50
	7.9 to 8.0	6.9 to 7.0	-5.00
	8.1 to 9.0	7.1 to 8.0	-10.00
	9.1 to 10.0	8.1 to 9.0	-15.00
	> 10.0	> 9.0	reject
75 μm	0.0 to 0.8	0.0 to 0.5	0.00
	0.9	0.6	-0.50
	1.0	0.7	-1.50
	1.1	0.8	-3.00
	1.2	0.9	-5.00
	1.3	1.0	-7.50
	1.4 to 1.5	1.1 to 1.2	-12.00
	> 1.5	> 1.2	reject

In addition to the above acceptance/rejection requirements for gradation, the following shall apply:

(a) The Lot will be rejected if the average of the Lot test results for the 4.75 mm size falls outside the gradation limits specified in Table 261-1.

(b) The Lot payment will be reduced by $5.00 per Tonne if the average of the Lot test results for the 0.075 mm size exceeds, up to a maximum of 1.0%, the upper gradation limit specified in Table 261-1.

(c) The Lot will be rejected if the average of the Lot test results for the 0.075 mm size exceeds, by more than 1.0 %, the upper gradation limit specified in Table 261-1.

Table 261-9
Payment Adjustment For Smoothness

Profile Roughness Index (PRI) per 100 m Section Profiled		
Tangents & Curves with Radius ≥ 600 m	**Curves with a Radius < 600 m Including Transitions**	**Percent of Unit Price to be Paid**
0 to 2.4 mm	0 to 4.4	105%
2.5 to 4.4 mm	4.5 to 8.4 mm	104%
4.5 to 6.4 mm	8.5 to 12.4 mm	103%
6.5 to 8.4 mm	12.5 to 16.4 mm	102%
8.5 to 10.4 mm	16.5 to 20.4 mm	101%
10.5 to 15.4 mm	20.5 to 25.4 mm	100%
15.5 to 17.4 mm	25.5 to 27.4 mm	98%
17.5 to 19.4 mm	27.5 to 29.4 mm	96%
19.5 to 21.4 mm	29.5 to 31.4 mm	94%
21.5 to 23.4 mm	31.5 to 33.4 mm	92%
23.5 to 25.4 mm	33.5 to 35.4 mm	88%
25.5 to 27.4 mm	35.5 to 37.4 mm	84%
27.5 to 29.4 mm	37.5 to 39.4 mm	80%
29.5 to 31.4 mm	39.5 to 41.4 mm	76%
31.5 to 33.4 mm	41.5 to 43.4 mm	72%
33.5 to 35.4 mm	43.5 to 45.4 mm	68%
35.5 to 37.4 mm	45.5 to 47.4 mm	64%
37.5 to 39.4 mm	47.5 to 49.4 mm	60%
≥ 39.5 mm	≥ 49.5 mm	56%

Table 261-10
Bump And Dip Penalty Schedule

Bump/Dip	Penalty
8.5 to 9.4 mm	$ 100.00
9.5 to 10.4 mm	$ 200.00
10.5 to 11.4 mm	$ 400.00
11.5 to 12.4 mm	$ 600.00
12.5 to 13.4 mm	$ 800.00
13.5 to 14.4 mm	$1000.00
14.5 to 15.4 mm	$1200.00
15.5 to 16.4 mm	$1400.00
16.5 to 17.4 mm	$1600.00
17.5 to 18.4 mm	$1800.00
≥ 18.5 mm	$2000.00

Table 261-11
Unit Price Adjustment for Air Voids (UPA_{AV})

Mean of Deviations of Air Voids from Target Value Air Voids (4.00%)	Unit Price Adjustment ($/t)
0.00 to 1.00	0.00
1.01 to 1.10	- 0.50
1.11 to 1.20	- 1.00
1.21 to 1.30	- 2.00
1.31 to 1.40	- 4.00
1.41 to 1.50	- 6.00
1.51 to 1.60	- 8.00
1.61 to 1.70	- 10.00
1.71 to 1.80	- 12.00
1.81 to 1.90	- 14.00
1.91 to 2.00	- 16.00
> 2.00	Reject

261.5 .4 Payment Adjustment for Use of Material Transfer Vehicle

.1 A unit price adjustment of + $3.00/t shall apply to the total quantity of asphalt concrete acceptably placed using a material transfer vehicle in accordance with this Item.

261.5 .5 Payment Adjustment for Change in PG Asphalt Binder Price

.1 Compensation payable to the Owner or the Contractor, for the difference in price of Asphalt Binder between the time of tender opening for this Contract and the time of the Work under this Item, will be calculated in accordance with the Tender Documents.

261.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of asphalt concrete, as identified under the Contract.

.2 Compensation to the Contractor or the Owner for differences between the asphalt binder content as determined by storage tank measurements, and the assumed asphalt binder content specified in 261.2.2.1 for the total payable tonnage, will be as follows:

  .1 Payment to the Contractor will be made for asphalt content in excess of the assumed asphalt binder content specified in 261.2.2.1 for the total payable tonnage, subject to the following limitations:

    .1 The maximum amount of asphalt content used in the above calculation will be the "Approved Asphalt Binder Content", from the JMF and subsequent approved adjustments, plus 0.65 % for Type B/HRB mix and 0.5 % for Type C/D mix.

    .2 Credit shall be given to the Owner for all asphalt binder content below the assumed asphalt binder content for the total payable tonnage.

    .3 Payments and credits will be based on the actual price per tonne as invoiced to the Contractor by the supplier for the Work.

    .4 Payments and credits will be determined on a Day by Day basis.

    .5 This determination is independent from and has no relationship to calculations for determining Unit Price adjustments as determined under 261.5.

.3 In the case that the Contractor initiates an appeal under 261.4.5.8, the following shall apply:

  .1 If the new test results after the appeal process indicates that a penalty no longer applies, then the testing costs incurred by the Owner during the appeal procedures for that Lot will be borne by the Owner.

    .1 Payment to the Contractor will be made for the sampling costs.

  .2 If the new test results after the appeal process verify that a penalty still applies or rejection remains valid for that Lot, the testing costs incurred by the Owner during the appeal procedure shall be charged, in accordance with Item 810, to the Contractor.

.4 If the Contractor carries out improvements for smoothness including repairs to individual bumps and/or dips, the smoothness shall be retested.

    .1 The Contractor shall be charged for the smoothness retesting in accordance with Item 810.

RESHAPING AGGREGATE BASE/SUBBASE — ITEM: 266

266.1 DESCRIPTION

.1 This Item consists of the scarifying, reshaping and compaction of the Aggregate Base/Subbase.

266.2 MATERIALS

.1 None identified.

266.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

266.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All Work shall be carried out to the full Roadbed width to intercept the existing Foreslopes.

.3 If scarifying is required to prepare the area for reshaping then the Contractor shall scarify the insitu material to a depth of 100 mm below the existing grade for Aggregate Base and 150 mm below the existing grade for Aggregate Subbase.

  .1 Scarifying shall ensure that the in situ material to the full depth treated is in a completely loosened state and the maximum dimension of any particle is 100 mm for Aggregate Base and 200 mm for Aggregate Subbase.

  .2 The Contractor shall not scarify more than 1 km in advance of the placement of the Aggregate Base or the fine grading opertaion.

.4 Shaping of the material shall be carried out in accordance with 203.4.

.5 The re-shaped Aggregate Base/Subbase material shall be compacted in accordance with Item 936 to a minimum of 95% of the maximum dry density.

.6 All grading shall be carried out in accordance with Item 941 and the finished graded surface shall not vary by more than ± 30 mm from the grades provided by the Engineer.

  .1 If at any time during the Work, the Work becomes rutted or displaced, the Contractor shall make all necessary repairs to reinstate the surface grade and if necessary, the depth rutted and/or displaced shall be scarified, reshaped and compacted to meet the requirements of this Item.

266.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of reshaped Aggregate Base/Subbase grade completed in accordance with this Item.

266.6 BASIS OF PAYMENT

.1 Payment for this Work shall include a separate Unit Price for each type of grade, as identified under the Contract.

267.1 DESCRIPTION

.1 This Item consists of the pulverizing, shaping and compaction of a Roadbed surface.

267.2 MATERIALS

.1 None identified.

267.3 SUBMITTALS

.1 None identified.

267.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All Work shall be carried out to the full Roadbed width to intercept the existing Foreslopes.

.3 The Contractor shall carry out the Work such that the pulverizing extends to a minimum depth of 100mm into the Aggregate Base/Subbase layer.

.4 The Contractor shall ensure that this pulverized region is in a completely mixed and loosened condition, with all material sized such that 100% of the material passes the 75 mm sieve, when measured in accordance with ASTM C136.

.5 Oversize pieces remaining after pulverizing shall become the property of the Contractor and shall be disposed of outside the Work Site.

.6 The re-graded surface material shall be compacted in accordance with Item 936 to a minimum of 95% of the maximum dry density.

.7 Final shaping of the pulverized surface shall be in accordance with Item 941 and shall not vary by more than 30 mm from the grades provided by the Engineer.

267.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of pulverizing completed in accordance with this Item.

267.6 BASIS OF PAYMENT

.1 Payment for this Work shall be at the Unit Price.

SHOULDER PROCESSING ITEM: 284

284.1 DESCRIPTION

.1 This Item consists of the processing, shaping and compaction of material on the Shoulder.

284.2 MATERIALS

.1 None identified.

284.3 SUBMITTALS

.1 None identified.

284.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

  .1 This Work shall be carried out before paving.

.2 A longitudinal cut between the edge of the existing asphalt concrete mat and the Shoulder Work shall be formed having a straight vertical face.

.3 The insitu material shall be processed, to a minimum depth of 150 mm and/or to the full depth of the abutting asphalt concrete, so that the material is in a completely mixed and loosened condition with all material sized so that 100% of the material passes the 75 mm sieve.

.4 Oversize pieces remaining after processing shall become the property of the Contractor and shall be disposed of outside the Work Site.

.5 The Contractor shall not permit more than 4 km to be open to traffic where the Shoulder processing operation is in progress.

  .1 Regardless of the length of the Work Area, the Shoulder processing shall be completed within 7 Days for any portion of the Work open to traffic.

  .2 Where the difference in elevation between the asphalt concrete and the Shoulder exceeds 70 mm in any portion of the Work, the Shoulder processing operation shall be completed within 48 hours of the commencement.

.6 The material shall be compacted to the maximum density as determined by a rolling pattern.

.7 Final shaping of the processed Shoulder material shall be consistent and continuous to the grade of the abutting asphalt concrete surface and shall extend at the specified Slope to the line of the Foreslope and shall be blended and shaped to the match the Foreslope intersection.

284.4 .8 The Contractor shall keep clean the adjacent Pavement surface and in all cases the Pavement surface shall be free of Shoulder material prior to opening the Work Area to traffic.

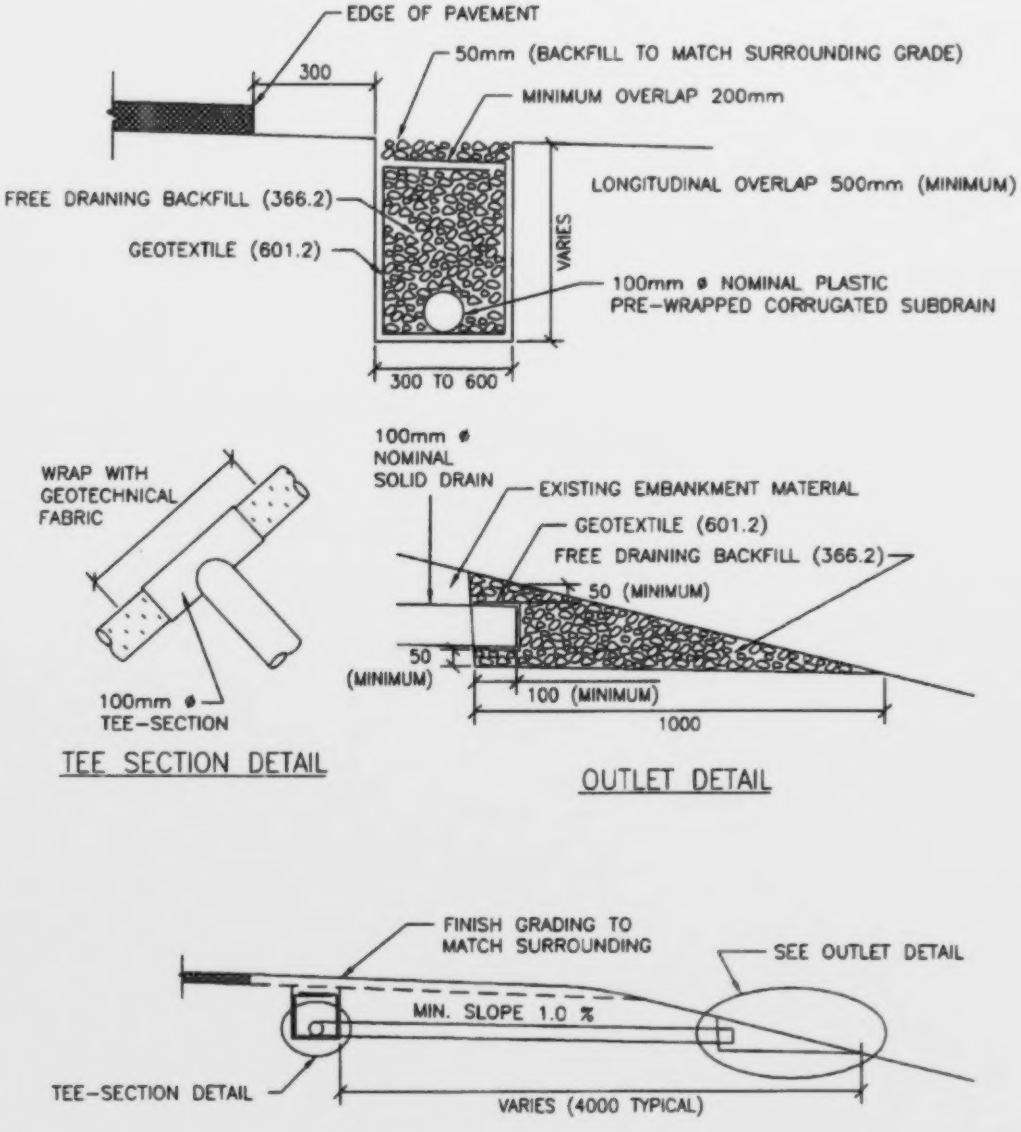
284.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of Shoulder processing completed in accordance with this Item.

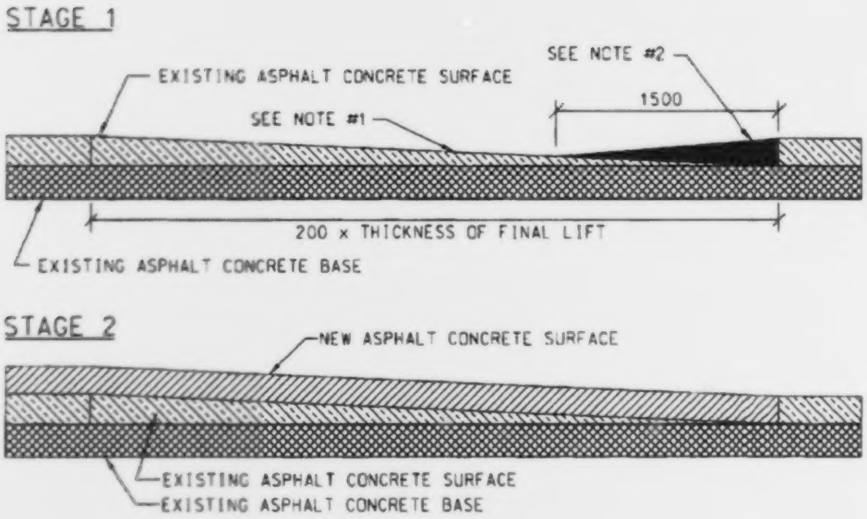
284.6 BASIS OF PAYMENT

.1 Payment for this Work shall be at the Unit Price.

.2 The Contractor shall be subject to a penalty of $500.00 per Day, for each occurrence, if the Shoulder processing operation is not carried out in the prescribed period as defined in 284.4.5.


EDGE OF PAVEMENT
300
50mm (BACKFILL TO MATCH SURROUNDING GRADE)
MINIMUM OVERLAP 200mm
LONGITUDINAL OVERLAP 500mm (MINIMUM)
FREE DRAINING BACKFILL (366.2)
GEOTEXTILE (601.2)
VARIES
100mm ø NOMINAL PLASTIC PRE-WRAPPED CORRUGATED SUBDRAIN
300 TO 600
WRAP WITH GEOTECHNICAL FABRIC
100mm ø TEE-SECTION
TEE SECTION DETAIL
100mm ø NOMINAL SOLID DRAIN
EXISTING EMBANKMENT MATERIAL
GEOTEXTILE (601.2)
FREE DRAINING BACKFILL (366.2)
50 (MINIMUM)
50 (MINIMUM)
100 (MINIMUM)
1000
OUTLET DETAIL
FINISH GRADING TO MATCH SURROUNDING
SEE OUTLET DETAIL
MIN. SLOPE 1.0 %
TEE-SECTION DETAIL
VARIES (4000 TYPICAL)

Shoulder Subdrain and Outlet Details

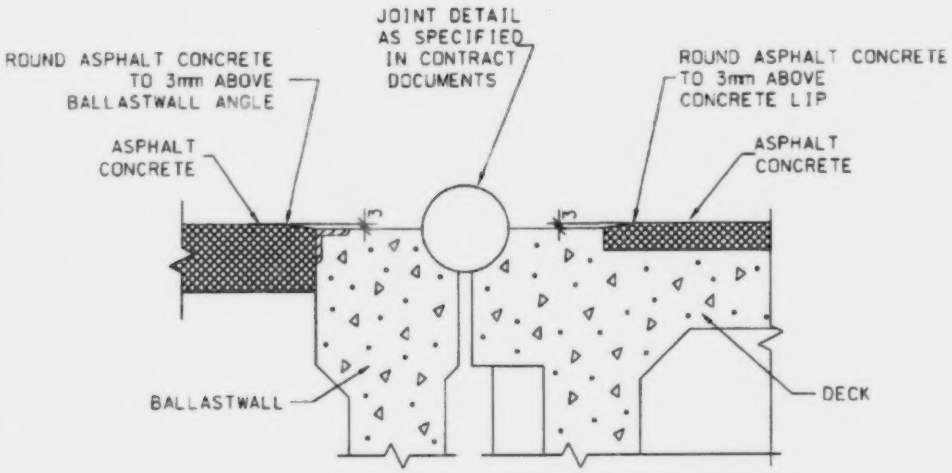

STAGE 1
SEE NOTE #2
EXISTING ASPHALT CONCRETE SURFACE
1500
SEE NOTE #1
200 x THICKNESS OF FINAL LIFT
EXISTING ASPHALT CONCRETE BASE
STAGE 2
NEW ASPHALT CONCRETE SURFACE
EXISTING ASPHALT CONCRETE SURFACE
EXISTING ASPHALT CONCRETE BASE

NOTE #1: THE EXISTING ASPHALT CONCRETE SHALL BE COLD MILLED TO THE SHAPE INDICATED.

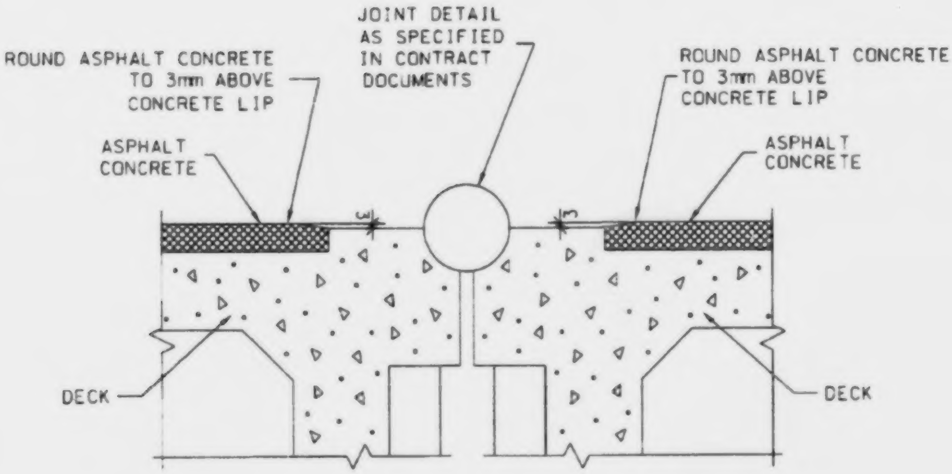
NOTE #2: WHEN THE EXISTING PAVEMENT HAS BEEN REMOVED IN ADVANCE OF PAVING THE JOINT AREA, THE CONTRACTOR SHALL CONSTRUCT A SMOOTH 1500mm LONG TAPER. THE TAPER MAY BE PLACED ON TAR PAPER AND SHALL BE REMOVED WHEN PAVING IS RESUMED. THE TRANSVERSE JOINT SHALL BE STRAIGHT AND HAVE A VERTICAL FACE WHEN THE TAR PAPER IS REMOVED.

File: 260-1

Construction Detail of a Transverse Key Joint


JOINT DETAIL AS SPECIFIED IN CONTRACT DOCUMENTS
ROUND ASPHALT CONCRETE TO 3mm ABOVE BALLASTWALL ANGLE
ROUND ASPHALT CONCRETE TO 3mm ABOVE CONCRETE LIP
ASPHALT CONCRETE
ASPHALT CONCRETE
3
3
BALLASTWALL
DECK

ABUTMENT


JOINT DETAIL AS SPECIFIED IN CONTRACT DOCUMENTS
ROUND ASPHALT CONCRETE TO 3mm ABOVE CONCRETE LIP
ROUND ASPHALT CONCRETE TO 3mm ABOVE CONCRETE LIP
ASPHALT CONCRETE
ASPHALT CONCRETE
3
3
DECK
DECK

EXPANSION PIER

File: 260-2

Construction Details at a Structure

DIVISION 300

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305	Tension Splices	2
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312	Steel Pipe Piles	14
321	Steel Sheet Pile Cofferdams	4
322	Excavation Within Cofferdams	1
331	Precast Prestressed Concrete Beams	14
332	Post-Tensioning System	7
335	Steel Superstructure	45
341	Steel Laminated Bearings	5
342	Bridge Pot Bearings	16
343	Sealed Expansion Joint Assemblies	3
344	Finger Joint Assemblies	3
345	Steel Ballastwall Angle	2
346	Guide Rail System - Structures	1

ITEM	DESCRIPTION	NUMBER OF PAGES
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351	Waterproofing	3
361	Shoring	2
365	Engineered Fill	3
366	Free-Draining Backfill	2
371	Removal of Asphalt Concrete - Structures	1
372	Removal of Deck Concrete	4
381	Removal of Structures	2
399	Standard Drawings	

302 - 1	Roadway Drain For Structures
302 - 2	Roadway Drain Details
302 - 3	Concrete Limits For Foundation Overexcavation
311 - 1	Steel H Piles - Pile Cap Details
311 - 2	Steel H Piles - Pile Point Details
311 - 3	Steel H Piles - Splice Details
311 - 4	Steel H Piles - Sequences for Welds for Horizontal Position
311 - 5	Steel H Piles - Sequences for Welds for Flat Position
312 - 1	Steel Pipe Piles - Pile Point Details
312 - 2	Steel Pipe Piles - Splice Details
331 - 1	Prestressed Beam Lifting Device Details - Vertical Only
342 - 1	Bridge Pot Bearings - Nomenclature
345 - 1	Ballastwall Protection Details
351 - 1	Deck at Barrier Wall/Curb Waterproofing Details
351 - 2	Ballast Wall Waterproofing System Details
366 - 1	Free Draining Backfill Placement Details

301.1 DESCRIPTION

.1 This Item consists of the proportioning, supply and placement of Portland cement concrete.

301.2 MATERIALS

301.2 .1 General

.1 All materials shall be supplied by the Contractor.

.2 Material properties shall conform to CSA A23.1, if not otherwise specified herein.

301.2 .2 Portland Cement

.1 GU Portland cement shall be used unless otherwise specified in the Contract Documents.

.2 Portland cement shall conform to the requirements of CSA A3001 and CSA A23.1.

301.2 .3 Water

.1 Water used in Portland cement concrete shall be subject to the prior approval of the Engineer.

301.2 .4 Aggregates

.1 Aggregates used in Portland cement concrete shall be subject to the prior approval of the Engineer.

301.2 .5 Superplasticizers

.1 Superplasticizers shall conform to the requirements of ASTM C494 Type F (water-reducing high range admixtures) or Type G (water-reducing, high range, and retarding admixtures).

.2 Superplasticizers used in Portland cement concrete shall be subject to the prior approval of the Engineer.

301.2 .6 Other Admixtures Not Covered By ASTM

.1 Use of other admixtures shall be subject to the prior approval of the Engineer.

.2 Where the use of other admixtures is approved, such admixtures shall conform to the recommendations of the manufacturer or as otherwise submitted with the design mix.

301.3 SUBMITTALS

.1 The Contractor shall have the source of supply of Portland cement concrete approved by the Engineer in advance of the supply of the concrete to the Work, and this approval shall consist of but not be limited to :

  .1 The Contractor shall provide the Engineer with the name of the proposed cement supplier.

  .2 The Contractor shall submit certification that the concrete supplier is certified in accordance with Atlantic Provinces Ready Mix Concrete Association, Plant Certification Program or equivalent.

    .1 The concrete supplier shall submit proof of certification in the appropriate categories in accordance with CSA A23.1.

    .2 Only concrete supplied from such certified plants shall be acceptable to the Owner and plant certification shall be maintained for the duration of the fabrication and erection until the warranty period expires.

.2 The proposed mix proportions (design), certified by the Contractor or his agent, shall be submitted at least 5 Days before concrete production is due to start.

301.4 CONSTRUCTION

.1 General

  .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Care and Storage of Materials

  .1 All Portland cement concrete materials shall be handled and protected in such a way as to prevent segregation, damage and contamination.

  .2 All cement, aggregate and other concrete construction materials shall be stored in accordance with the requirements of CSA A3001, and CSA A23.1.

.3 Proportioning and Composition of Concrete

  .1 The Contractor shall be responsible for providing concrete mix designs for each Exposure Class of concrete specified and proposed for use.

  .2 If, during the progress of the Work, it is determined that the concrete has inadequate workability, or does not meet the requirements of the Specification(s), the Contractor shall submit a new mix design to the Engineer, in accordance with the 301.3.2.

  .3 All concrete shall be proportioned in accordance with the submitted mix designs.

301.4 .4 Consistency

.1 The slump shall be in accordance with Table 301-1 for the class of concrete specified, except the slump for slipformed concrete shall be limited to a maximum of 50 mm, or to such other value as may be necessary to enable the material to be slipformed without subsequent distortion.

301.4 .5 Concrete Production

.1 Portland cement concrete shall be produced in accordance with the requirements of CSA A23.1.

.6 Delivery

.1 Delivery of Portland cement concrete shall be regulated so as to enable continuous deposition until the placement of each concrete section is completed.

.7 Placement

.1 The Contractor shall be responsible for all formwork design and construction in accordance with CSA A23.1.

.2 All concrete placement shall be in accordance with CSA A23.1, unless otherwise noted.

301.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of cubic metres of Portland cement concrete proportioned, supplied and placed in accordance with this Item.

301.6 BASIS FOR PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each class of concrete, as identified under the Contract.

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302.1 DESCRIPTION

.1 This Item consists of the supply, placement and finishing of concrete in Structures.

.2 This Item is subdivided into, but not limited to, the following types:

.1 Concrete In Structures "A"

.1 Concrete for use in Bridge abutments including but not limited to, abutment barrierwalls, safety-curbs, sidewalks and independent curb and gutter at the end of wingwalls.

.2 Concrete In Structures "B"

.1 Concrete for use in Bridge abutment approach slabs.

.3 Concrete In Structures "C"

.1 Concrete for use in Bridge piers.

.4 Concrete In Structures "D"

.1 Concrete for use in Bridge deck slabs including but not limited to, diaphragms, barrierwalls, safety-curbs, sidewalks and other integral deck components.

.5 Concrete In Structures "E"

.1 Concrete for use as tremie concrete in footings.

.3 A continuous structure is defined as the complete deck slab between the expansion joints.

302.2 MATERIALS

302.2 .1 General

.1 All materials shall be supplied by the Contractor.

.2 Material properties shall conform to CSA A23.1, if not otherwise specified herein.

302.2 .2 Material Properties

.1 Aggregates

.1 The coarse aggregate and fine aggregate shall each be stockpiled separately.

.2 Stockpiles shall be placed on a level well drained base and constructed in such a manner that segregation and contamination does not occur.

.1 Stockpiles shall be checked during the normal course of the Work, for conformance to the grading limits specified.

302.2.2.1.2 .2 Segregated or contaminated stockpiles shall not be incorporated into the Work.

.3 Stockpiles shall be maintained so that there is a sufficient supply of aggregates for the production of concrete to be placed in the following 14 Days.

.3 Fine and coarse aggregates shall only be combined in the specified proportions at the time of batching.

.4 Petrographic examination of the aggregates shall be made in accordance with ASTM C295.

.1 The petrographic examination shall detect the presence of deleterious shale, mica, coated grains, soft flaky particles, chert, and all deleterious substances which are known to cause harmful reactions in Portland cement concrete mixtures.

.2 The aggregate petrographer will be responsible to describe each rock type present in an aggregate sample and to comment on the unfavourable effects of any material which is known to be deleterious.

.3 When the sample has been found to posses properties or constituents that are known to have specific unfavourable effects on concrete, those properties or constituents shall be described qualitatively and, to the extent practicable, quantitatively.

.1 Additional testing will be necessary to prove the aggregate will have no deleterious effect on concrete.

.2 The Engineer may request specific testing in addition to the petrographic examination.

.4 Aggregates considered on the basis of a petrographic examination to be potentially reactive or deleterious may be rejected by the Engineer.

.5 Blending of aggregates shall only be permitted to meet the grading requirements.

.1 The blending materials shall individually meet the requirements of this Item with the exception of the grading requirements.

302.2.2 .2 Fine Aggregate

.1 Fine aggregate shall consist of uncoated natural sand, manufactured sand or an approved combination.

.2 The amounts of deleterious substances in fine aggregate, each determined on independent samples complying with the grading requirements indicated in CSA A23.1, shall not exceed the limits specified in Table 302-1.

Table 302-1
Limits for Deleterious Substances and Physical Properties of Fine Aggregate

Deleterious Substances and Physical Properties	Test Procedures	Test Limits (%)
Coal and Lignite	Note [1]	0.25
Micro Deval	CSA A23.2-23A	16.0
Alkali Aggregate Reaction [2]	CSA A23.2-14A Modified [3]	0.035 @ 2 years

Note [1] - The sample shall first be tested for low density material in accordance with CSA A23.2-4A. The material retained on the liquid with a specific gravity of 2.0 shall be dried and the portion which is coal or lignite shall be determined by petrographic examination.

Note [2] - Test runs for a period of two years. There will be no testing on the third year. Following the year of no testing the cycle will begin again. New results required within 3 years of previous results.

Note [3] - Testing period shall be 2 years. Job mix aggregate combination shall contain 430 kg/m^3 cement content.

302.2.2 .3 Coarse Aggregate

.1 The amount of deleterious substances in coarse aggregate, determined on independent samples complying with the grading requirements in CSA A23.1, shall not exceed the limits prescribed in Table 302-2.

Table 302-2
Limits for Deleterious Substances and Physical Properties of Coarse Aggregates

Deleterious Substances	Test Procedures	Test Limits (%)
Coal and Lignite	Note [1]	0.5
Micro Deval	CSA A23.2-29A	14.0
Particle Shape	CSA A23.2-13A	15
Unconfined Freeze Thaw	CSA A23.2-24A	6
Alkali Aggregate Reaction [2]	CSA A23.2-14A Modified [3]	0.035 @ 2 years

Note [1] - The sample shall first be tested for low density material in accordance with CSA A23.2-4A. The material retained on the liquid with a specific gravity of 2.0 shall be dried and the portion which is coal or lignite shall be determined by petrographic examination.

Note [2] - Test runs for a period of two years. There will be no testing on the third year. Following the year of no testing the cycle will begin again. New results required within 3 years of previous results.

Note [3] - Testing period shall be 2 years. Job mix aggregate combination shall contain 430 kg/m^3 cement content.

302.2.2 .4 Water

.1 The source of supply shall be the responsibility of the Contractor.

302.2.2 .5 Admixtures

.1 A written statement from the manufacturer stating that the admixture contains no purposefully added calcium chloride shall be provided to the Engineer.

302.2.2 .6 Curing Materials

.1 Burlap or non-woven geotextile shall be used for curing horizontal surfaces.

.2 For vertical surfaces, curing shall be carried out by placing plastic over the burlap and securing the burlap and plastic in place against the vertical surface.

.3 Curing materials shall, at any time of use, be in good condition free from holes, dirt, clay or other substance which would have a deleterious effect upon concrete.

.4 Burlap shall be of a quality which will absorb water readily when dipped or sprayed and shall have a mass of not less than 237 g/m^2 when clean and dry.

302.2.2 .7 Cement And Supplementary Cementing Materials

.1 The Portland cement shall be a blended Portland silica fume cement, GUb 7.5 SF (low alkali) meeting the requirements of CSA A3001.

.2 Fly ash meeting the requirements of CSA A3001 may be used in concrete, however, the Engineer reserves the right to limit its proportion to 20% of the cementing materials content in the mix.

302.2 .3 Composition of Concrete Mix

302.2.3 .1 General

.1 The Contractor shall be responsible for the concrete mix design.

.2 It shall be the responsibility of the Contractor to ensure that the mixture proportions submitted to the Engineer are properly batched, mixed, placed and cured such that the concrete conforms to the Specification.

.3 Concrete types A, B, C, and D shall be exposure Class C-XL and type E shall be F-1.

.4 A calcium nitrite corrosion inhibitor shall be added to all concrete in the abutments above the elevation of the Bridge seat, bearing blocks, approach slabs overlaid directly with asphalt concrete (excluding approach slabs buried below grade) and to concrete in the Superstructure.

.1 The dosage rate shall be 15 L/m^3.

302.2.3.1.4 .2 The corrosion inhibiting calcium nitrite admixture shall be manufactured by a firm with a minimum of five years infield experience in the use of corrosion inhibitors for concrete and shall contain between 30% to 36% calcium nitrite by weight of solution.

.3 The calcium nitrite shall be added at the concrete ready mix plant and verification shall be provided to the Engineer for the quantity of the calcium nitrite added to each batch of concrete.

  .1 Acceptable verification shall include, but is not necessarily limited to, printouts from computerized batch plants or printouts from computerized admixture dispensing units.

  .2 Verification shall be provided on the delivery slip.

302.2 .4 Associated Materials

.1 When detailed in the Contract Documents, the Contractor shall supply the following:

  .1 The 20 mm diameter PVC pipe drains for the deck slab waterproofing.

  .2 Guide rail inserts (complete with NC thread 16 mm diameter x 30 mm long cadmium plated hex head bolts) for the endposts of abutments.

  .3 The 13 mm asphalt impregnated fibreboard for between approach slabs and abutments.

  .4 Neoprene sponge and concrete sealant for construction joints.

  .5 The complete pintle assemblies required at the concrete bearing blocks.

  .6 Roadway drains as shown on Standard Drawings 302-1 and 302-2.

  .7 765 mm special end shoes as shown on Standard Drawing 512-3.

.2 Safety anchor assemblies shall be available from the Owner.

.3 Materials shall be stored at least 100 mm off the ground.

302.3 SUBMITTALS

.1 The Contractor shall submit the source of supply of Portland cement concrete to the Engineer 14 Days in advance of the supply of the concrete to the Work, and this submittal shall consist of but not be limited to:

  .1 A statement signed by an officer or designated person having the authority, certifying that the cement furnished does not exceed 0.6% alkali equivalent, as measured by the percent of sodium oxide plus 0.658 times the percent of potassium oxide.

    .1 All testing for alkali content shall be carried out in accordance with CSA A3001-03, clause 4.3.5.

302.3 .2 Certification that the concrete supplier is certified in accordance with Atlantic Provinces Ready Mix Concrete Association, Plant Certification Program or the equivalent as follows:

.1 The concrete supplier shall submit proof of conformance to the requirements for the production of the concrete in accordance with CSA A23.1.

.2 Only concrete supplied from such certified plants shall be acceptable to the Owner and plant certification shall be maintained for the duration of the Work.

.3 Proposed sources of aggregates and test results shall be submitted to the Engineer, in writing, a minimum of 14 Days prior to the proposed use of such materials.

.1 This notification period shall be increased to a minimum of 35 Days if the aggregates proposed for use have not been previously approved for use in the Owner's projects.

.4 The proposed design mix proportions, certified by the Contractor or his agent, and stamped and signed by a Professional Engineer registered or licensed to practise in the Province of New Brunswick, shall be submitted at least 14 Days before concrete production is due to commence.

.2 Other submittals are required for this Item and are contained within the sections applicable to the specific phase of the Work being undertaken.

.3 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

302.4 CONSTRUCTION

302.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Concrete materials and methods of concrete construction and methods of test for concrete shall conform to CSA A23.1 and CSA A23.2, if not otherwise specified herein.

.3 The Contractor shall notify the Engineer at least two Days in advance of the commencement of each concrete placement.

.4 When detailed in the Contract Documents the Contractor shall install the associated materials described in 302.2.4 in accordance with the Contract Documents.

302.4 .2 Equipment and Production

302.4.2 .1 Batching

.1 The Contractor has the responsibility to ensure that the concrete mix proportions are being accurately and consistently batched to produce the specified mix and concrete properties.

.1 The moisture content for aggregates shall be determined and adjustments made prior to the batching of concrete.

302.4.2 .2 Mixing

.1 Mixers and agitators used for transporting concrete shall deliver their load to the Work Site and discharge shall be completed within 1½ hours of completion of batching unless a longer time is specifically authorized in writing by the Engineer.

.1 Under conditions contributing to rapid stiffening of concrete the Engineer may specify a time of less than 1½ hours.

302.4 .3 Falsework and Formwork

.1 The Contractor shall be responsible for all falsework design and construction in accordance with Item 957.

.2 The Contractor shall be responsible for all formwork design and construction in accordance with Item 958.

.3 All submissions with respect to falsework and formwork shall be in accordance with Item 956.

302.4 .4 Placement

302.4.4 .1 General

.1 All concrete shall be placed in a space free of standing water, unless otherwise specified in the Contract Documents.

.1 New concrete shall be defined as concrete that has not attained its minimum specified compressive strength.

.2 All loads to be applied on new concrete shall be subject to the approval of the Engineer.

.2 Bonding of new concrete on hardened concrete shall be carried out as follows:

.1 Before depositing new concrete on concrete that has set, the forms shall be re-tightened and the surface of the hardened concrete shall have all foreign matter and laitance removed.

302.4.4.1.2 .2 Hardened concrete surfaces shall be thoroughly saturated with water, without ponding, in advance of placing concrete.

.3 Methods of obtaining an adequate bond between the hardened and fresh concrete shall be subject to the approval of the Engineer.

.3 Concrete temperatures from the time of batching until final placing shall be maintained between 10 °C and 25 °C, unless otherwise authorized in writing.

.4 Concrete shall be placed while still plastic and workable.

.1 Concrete at the advancing face of the concrete placement must be plastic and cold joints within a concrete placing operation shall not be permitted.

.2 Retempering any partially hardened concrete with additional water will not be permitted.

.5 Concrete placement advancement shall be upgrade unless otherwise noted in the Contract Documents and/or authorized by the Engineer.

.6 If the concrete details are such that a feather edge or thin section might be created by the sequence of placing, a bulkhead shall be introduced to maintain an edge thickness of at least 100 mm.

302.4.4 .2 Footings and Working Slabs

.1 Where Overexcavation occurs in the solid rock excavation for footings, concrete shall be placed in accordance with Standard Drawing 302-3 and as follows:

.1 Down to an elevation of 150 mm below the specified elevation of the bottom of the footing, the Contractor shall place the concrete specified for the footing.

.2 If the Overexcavation is in excess of 150 mm below the specified elevation of the bottom of the footing, the Contractor shall place working slab concrete from the bottom of the excavation up to the bottom of the specified footing elevation.

.1 The working slab shall have a minimum specified compressive strength of 20 MPa at 28 Days.

.2 Prior to the placement of footings, the working slab concrete shall have a minimum compressive strength of 5 MPa.

.3 For stepped footings and similar stepped formwork details, where concrete has to be placed in two or more stages and where the monolithic nature has to be maintained, the upper portion shall be placed as soon as stiffening of the concrete in the lower portion will permit.

.1 The concrete in the lower portion shall be designed so as to minimize bleeding; any free water or laitance shall be removed before the next layer of concrete is placed.

302.4.4 .3 Columns

.1 Concrete in columns shall be placed in one continuous operation unless otherwise noted in the Contract Documents and/or as directed by the Engineer.

.2 Prior to the placement of walls or column formwork all concrete in footings must have attained a minimum compressive strength of 20 MPa and the footing curing and protection requirements must be satisfied in accordance with 302.4.8.

.3 Concrete in columns shall be allowed to cure a minimum of 36 hours before adjacent formwork is placed.

.4 Falsework supported by brackets on columns shall not be placed until concrete has attained 60% of its minimum specified compressive strength.

.5 Unless specifically permitted by the Engineer, in writing, concrete shall not be placed in the Superstructure until column forms have been stripped sufficiently to determine the character of concrete in the columns.

302.4.4 .4 T-Beam Spans

.1 Concrete in girder webs shall be deposited uniformly in horizontal layers.

.2 Concrete in a T-Beam span shall be placed in one continuous operation.

302.4.4 .5 Box Girders

.1 Concrete in box girders shall be placed in two or three separate operations.

  .1 The bottom slab shall be placed first with a construction joint between the bottom slab and the webs.

302.4.4 .6 Decks and Diaphragms

.1 All diaphragm concrete, with the exception of continuous pier diaphragms for Bridges with prestressed girders that are made continuous for live load and integral abutment diaphragms, must have attained 60% of its minimum specified compressive strength, prior to placing the concrete for the deck slab.

  .1 Pier diaphragms in prestressed concrete girder Bridges that are made continuous for live load shall be placed concurrently with the portion of the deck over the same pier, as shown on the concrete placement diagram in the Contract Documents.

.2 Deck concrete shall be placed uniformly and symmetrically with respect to the width of the Structure.

  .1 Bulkheads for the deck slab placement shall remain in place for at least 36 hours following the initial set of the deck slab concrete.

302.4.4.6 .3 The deck slab concrete must have attained 80% of its minimum specified compressive strength prior to the placement of curb, barrierwalls or Sidewalk concrete or any other superimposed dead load on the deck slab.

.4 The deck slab concrete and continuous pier diaphragms must have attained 80% of its minimum specified compressive strength prior to the placement of any vehicles on the deck slab.

302.4.4 .7 Superstructure Reactions on Bents, Piers or Abutments

.1 The load of the Superstructure shall not be allowed to come upon the bents, piers or abutments until concrete in the bents piers or abutments has reached the minimum specified compressive strength.

302.4.4 .8 Profile of Bridge Superstructure Components

.1 Longitudinal girders, transverse floor beams and stringers will be profiled by the Engineer.

.1 The Contractor shall notify the Engineer of the availability of his safety support system a minimum of 7 Days in advance of the placement of any falsework, formwork or other additional loads on the Superstructure to allow for the profiling.

.2 Where excessive camber of precast pre-stressed beams occurs, the Contractor shall carry out grade adjustments, as directed by the Engineer.

302.4.4 .9 Bridge Decks

.1 The deck slab concrete for a simple span shall be placed in one continuous operation, starting at one end of a span and proceeding to the other end, unless otherwise noted in the Contract Documents.

.2 Concrete in continuous slab and slab-on-girder Bridges shall be placed as shown in the Contract Documents.

.1 Placing of concrete in deck slabs shall be continuous between construction joints.

.2 Vehicles or any superimposed dead load shall not be allowed on any portion of a continuous structure until all concrete has attained 80% of its minimum specified compressive strength.

.3 Deck slab, safety curb, parapet, barrier wall and Sidewalk concrete shall not be placed between November 1st and May 1st, unless authorized by the Engineer, in writing.

.4 During the concreting of the deck slab and barrier walls the Contractor shall ensure, at no cost to the Owner, that cement paste or other leakage from the forms is removed from the exposed portions of a steel superstructure employing an Engineer approved pressurized water spray.

302.4.4 .10 Steel Girder Bridges

.1 Before deck slab concrete is placed on steel spans, the falsework supporting Bridge girders shall be removed.

.2 The placement of deck concrete for any single placement on a continuous Structure shall not proceed until the minimum specified compressive strength has been attained for the preceding concrete deck placement(s) as detailed in the Contract Documents.

302.4 .5 Tremie Concrete

.1 The methods, Equipment and materials to be used to place concrete underwater shall be subject to the approval of the Engineer.

  .1 If a concrete pump is proposed for the concrete placement the Contractor shall submit to the Engineer the method of maintaining or recharging the continuous flow of concrete in accordance with CSA A 23.1, Clause 7.

.2 Tremie pipes shall be kept filled with concrete while depositing and shall have a maximum spacing of 3.0 m.

.3 During placing, the upper surface of the concrete must be kept as level as possible and particular care must be taken to ensure that the tremie concrete has a reasonably smooth and level upper surface within +150 mm or - 50 mm of the elevation designated in the Contract Documents.

  .1 Concrete in excess of 300 mm of the upper designated surface shall be removed.

.4 Prior to any placing of the tremie concrete, vertical shaft reinforcing bars in the tremie area shall be securely held in proper alignment by steel templates.

  .1 The lower template shall be located a maximum of 1 m above the top of the tremie.

  .2 The upper template is to be positioned near the top of the cofferdam.

.5 During placing of the structural tremie, the Contractor must satisfy, as a minimum, the following conditions:

  .1 The Contractor shall only begin the tremie placement, for the footings of any pier, once the Contractor warrants the capability of supplying and placing the concrete at a rate of not less than 40 cubic metres per hour throughout the entire placement.

  .2 The concrete must contain enough retarder to ensure a minimum depth of 1 m of fluid concrete at any time during the placement.

  .3 A maximum centre to centre spacing of tremie pipes shall be 3 m in any footing concrete placement and the outside rows of tremie pipes shall be spaced a maximum of 1.5 m from the inside face of the sheet piling cofferdam walls.

.6 In the area of pier shafts, at the top of the structural tremie footing, the laitance shall be removed and the top of the footing shall be chipped down to sound concrete.

  .1 All laitance and concreting residue shall become the property of the Contractor and shall be disposed of outside the Work Area.

302.4.5 .7 The Owner shall arrange to have one or more cores drilled from the structural tremie concrete of each pier for the purpose of checking the quality and strength of the concrete.

- .1 The Contractor shall, as part of the Work, provide access, platforms and whatever other assistance may be necessary to enable the drilling to be carried out efficiently.
- .2 The Contractor shall suspend all of his construction operations on the pier during the tremie coring operation.

.8 Should such samples fail to meet the Specifications, the Contractor shall at his own expense, carry out corrective measures, subject to the approval of the Engineer, to remedy the deficiencies identified in the structural tremie concrete.

302.4 .6 Construction Joints

302.4.6 .1 Limitation in Use of Construction Joints

- .1 Construction joints will not be permitted except those shown in the Contract Documents or as approved in writing by the Engineer, unless occasioned by the breakdown of the Equipment, or other unforeseen reasons, in which case the Contractor shall provide bulkheads parallel to the principal lines of stress.
- .2 Vertical construction joints in deck slabs will not be allowed parallel to the centreline of the Roadway.

302.4.6 .2 Use of Keys

- .1 Suitable keys shall be formed at the top of the upper layer of each day's Work and at other levels where Work is interrupted.
- .2 Keys or construction joints shall be of the type and detail as shown in the Contract Documents, unless otherwise permitted by the Engineer.

302.4 .7 Placing and Finishing Plastic Concrete

302.4.7 .1 Tolerances

- .1 Unless otherwise required in the Contract Documents, the maximum deviations from line, grade and dimension shall be as shown in Table 302-3.

Table 302-3
Placing and Finishing Tolerance Limits

Position in Structure		Tolerance
Finished Bridge Deck	Grades Surface variation	± 8 mm 8 mm over 3 m
Approach Slab directly overlaid with asphalt concrete	Grades Surface variation	± 8 mm 8 mm over 3 m
Approach Slab buried below grade	Grades Surface variation	± 8 mm 12 mm over 3 m
Concrete Bridge Bearing Block or Seat	Grades Surface variation from level	+1 to -5 mm ± 0.1°
Footing Grades		-10 mm/+50 mm
Columns, Walls, Cap Beams and High Quality Surface Areas and exposed Wingwalls	Surface variation from true line	≤ 5 mm
Misplacement or eccentricity in Pier, Cap Beam & Bridge Seat		± 10 mm
Columns, Piers, Walls, Beams and High Quality Surface Areas and exposed Wingwalls	Cross sectional dimensions	- 5 mm/+ 10 mm
Footings	Plan dimensions width/length	- 10 mm
	Misplacement or eccentricity	± 1% of footing dimension in direction of misplacement but < 50 mm
Variation in sizes and location of Slab and Wall openings		± 10 mm

302.4.7 .2 Upper Horizontal Surfaces

.1 The concrete shall be placed in the forms in such a way that the final elevation of the upper horizontal surfaces shall be as indicated in the Contract Documents and/or as directed by the Engineer.

.1 Use of mortar topping shall not be permitted.

.2 Steel floats shall not be permitted.

302.4.7 .3 Bearing Surfaces

.1 Where bearing pads (other than steel) are shown in the Contract Documents, concrete surfaces on which pads are to be placed shall be wood or magnesium floated to a level plane.

.1 If bearing block surfaces are ground to meet tolerances, the surface shall be artificially roughened as required to produce a surface texture similar to coarse sandpaper.

302.4.7 .4 Bridge Curbs and Sidewalks

.1 Sidewalks and curbs shall be constructed by placing concrete continuously to the elevations shown in the Contract Documents.

.2 The concrete shall be worked with a magnesium float to give a uniform surface.

.3 Floating shall be kept to a minimum consistent with the desired finish.

.4 Before this finish has set, the surface shall be lightly roughened, perpendicular to the centre line of the Roadway, with a fine dry broom.

302.4.7 .5 Bridge Decks

.1 Concrete Bridge decks shall be finished by power machine method as specified in the following sections.

.2 Continuous access to the Bridge deck surface during finishing operations shall be provided by the Contractor.

  .1 Access shall be provided by means of suitable transverse Bridges.

  .2 The access Bridges shall be positioned as required by the Engineer.

.3 Placing of concrete in Bridge decks shall not be permitted until the Engineer is satisfied that:

  .1 The rate of producing and placing concrete will be sufficient to complete finishing operations within the scheduled time.

  .2 The necessary tools and Equipment are at the site and in satisfactory condition for use.

.4 The finishing operations for silica fume modified concrete shall be limited to screeding and/or bull-floating.

.5 Falsework and wedges shall be checked immediately prior to placing Bridge deck concrete, and the Contractor shall make necessary adjustments.

  .1 Care shall be exercised to ensure that settlement and deflection due to the added weight of the Bridge deck concrete will be a minimum amount.

  .2 Suitable means shall be provided by the Contractor to permit immediate measurement by the Engineer of settlement and deflection.

.6 Screed bars or pipes shall be set to the correct elevation, to form the surface of the Bridge deck to the line and grade as shown in the Contract Documents, with allowances, as required, for any anticipated settlement and/or cambered deflection of the Structure.

302.4.7.5.6 .1 Screed bars and pipes shall be of such type and be installed so that they will not deflect appreciably under the applied loads.

.2 Screed pipes or bars for deck pours shall be firmly secured prior to placing concrete.

.3 Supports for screed pipes or bars shall not be carried upon reinforcing steel.

  .1 If the supports for the rails are located in the concrete, the supports shall be the type which can be removed without disturbing the concrete, or partially removed so that no part remains less than 70 mm below the finished concrete surface.

    .1 The supports shall be removed and the resulting holes filled with deck concrete before the deck concrete has hardened.

.4 The Contractor shall be responsible for the design of deck hangers and form brackets to support the additional loads imposed by the power-driven screeding machine.

302.4.7 .6 Deck Surface Repairs to Meet Tolerances

.1 High areas in excess of the 8 mm permissible tolerance may be removed by abrasive means provided the minimum cover requirements specified in the Contract Documents are met.

.2 Low areas in excess of 8 mm may be repaired in accordance with the requirements of 372.4.2, unless otherwise authorized by the Engineer.

  .1 It will not be acceptable to achieve this repair by placing grout or concrete over deck concrete that has hardened.

302.4.7 .7 Screed Machines

.1 Screeding of Bridge decks shall be accomplished by power-driven Bridge deck screeding machines, approved by the Engineer.

.2 Prior to beginning concrete placing operations, the screeding machine shall be operated over the full length of the Bridge segment to be placed.

  .1 This test run shall be made with the screed in its finishing position.

  .2 While operating the screeding machine in this test, the screed rails shall be checked for deflection and proper adjustment, the cover on slab reinforcement measured and the controlling dimensions of slab reinforcement and forms checked.

  .3 Necessary corrections shall be made before starting the placement of concrete.

302.4.7.7 .3 After the concrete has been placed, spread and consolidated to provide a uniformly dense slab, the surface shall be struck off immediately by the passage of the screeding machine.

  .1 The screeding machine shall carry sufficient concrete in front of the screed to fill low porous places.

  .2 This operation shall be repeated as may be necessary to produce a uniformly consolidated dense smooth surface true to the lines and grades.

  .3 The Contractor shall verify the top cover on the reinforcing steel and the thickness of the deck slab immediately following the screeding operation.

.4 The final deck finish shall be obtained by methods approved by the Engineer.

302.4 .8 Curing and Protection

.1 The Contractor shall submit to the Engineer for approval, 3 Days prior to the concrete placement, the proposed method and sequence to be employed in the Work for the curing and protection of the concrete.

.2 Concrete shall be protected against plastic or dry shrinkage cracking by strict adherence to ACI 302 and ACI 308.

.3 All exposed concrete surfaces, mortar and grout shall be continuously moist cured.

  .1 The curing period for concrete shall be for a minimum of 7 Days from the completion of concrete placement.

  .2 The curing period for mortar or grout shall be 3 Days from the completion of mortar or grout placement or as recommended by the manufacturer.

  .3 A burlap or non-woven geotextile fabric shall be applied immediately after finishing of the concrete surface.

  .4 A fog mist system shall be applied continuously to bridge decks from the time of screeding until concrete is covered with burlap or non-woven geotextile fabric, in such a way as to maintain high relative humidity above the concrete and prevent drying of the concrete surface.

    .1 Water shall not be allowed to drip, flow or puddle on the concrete surface during fog misting, when placing the burlap or non-woven fabric or at any time before the concrete has achieved final set.

.4 Equipment and materials necessary for curing and protection of concrete shall be available and ready for use before actual placing is started.

.5 Freshly finished concrete shall be protected from the elements and from defacement due to construction operations.

  .1 The Contractor shall repair or replace, subject to the approval of the Engineer, any concrete damaged by the elements or defacement.

302.4.8 .6 It shall be the responsibility of the Contractor to ensure that the system of curing and protection is properly constructed and maintained for the period of time required.

.7 Material or Equipment, other than that required for actual curing operations, shall not be placed on either the concrete deck being cured or portions of decks on adjacent spans of continuous Structures, without the approval of the Engineer.

.8 Bridge decks shall be barricaded from traffic until completely cured.

.9 Formwork shall not be removed before 7 Days without the approval of the Engineer.

  .1 When formwork is removed prior to the completion of curing, the newly exposed concrete surfaces shall be kept moist until the curing period is completed.

302.4 .9 Cold Weather Requirements

302.4.9 .1 General

  .1 For the purpose of this specification cold weather shall be considered to be when ambient temperature is at or below 5 °C, or in the Engineer's opinion, is likely to fall below 5 °C within the next 24 hours.

  .2 The Contractor shall ensure that all boilers used for heating, materials or housing, shall meet the inspection requirements and operating conditions of all applicable Provincial Acts and Regulations.

302.4.9 .2 Materials

  .1 The temperature of material charged in the mixer shall be such that the temperature of the mixed concrete, at the time of placement does not exceed 25 °C nor shall it be less than 10 °C.

    .1 The Contractor may heat water, or water and aggregate, to ensure that these temperature limits will be met.

  .2 Frozen lumps of aggregate shall be excluded from the mix.

  .3 Water over 35 °C shall not be brought in direct contact with the cement.

302.4.9 .3 Placing

  .1 Concrete shall not be placed against frozen surfaces.

  .2 Formwork, existing concrete at a construction joint, and reinforcing steel shall be free of ice and snow and shall be preheated to and maintained at a temperature of not less than 5 °C.

302.4.9 .4 Enclosed Protective Housing

.1 Protective housing shall be wind and weather tight, constructed of suitable materials on a substantial framework.

 .1 Housing shall be of adequate size so proper placing and finishing procedures can proceed unhampered.

.2 Use of "roll back" sheeting or tarpaulins supported from screed rails or other means is permitted on horizontal surfaces, provided:

 .1 their use does not preclude the attaining of the required surface finish,

 .2 the concrete is covered progressively as placed, and

 .3 the resulting housing satisfies all the specified provisions of this Item.

302.4.9 .5 Heating Within A Housing

.1 Housing shall be constructed so that it is clear of concrete and formwork by a minimum of 300 mm at all points.

 .1 This minimum shall include the underside of Bridge beams, slabs, capbeams, columns and walls unless the Engineer has authorized the protection of these areas by insulated formwork.

.2 The heating system shall provide at all times, an air temperature throughout the housing of not less than 10 °C nor more than 32 °C.

.3 These conditions shall be maintained for a minimum of seven continuous Days and until the minimum specified compressive strength is obtained.

.4 Unvented heaters shall be removed from the placement area prior to the placement of concrete.

 .1 All concrete surfaces shall be checked prior to acceptance into the Work with phenolphthalein (carbonation indicator) to ensure that surfaces are not damaged by combustion products.

.5 At the time of placing and during curing, concrete surfaces shall be protected by formwork or an impermeable membrane from direct exposure to combustion gases or drying from heaters.

 .1 When dry heat is used the products of combustion shall be vented to the outside air and concrete surfaces shall be kept continuously wet.

.6 The housing shall be completed and the heating system shall be in operation for a sufficient period prior to placing concrete to prove the adequacy of the Equipment to establish and maintain the specified curing conditions during the placing and throughout the specified curing period.

302.4.9 .6 Insulation

.1 Insulation may be used to protect concrete providing weather conditions and insulation procedures are such that the temperature of the surface of the concrete is maintained at a minimum of 10 °C and a maximum of 50 °C for a period of 7 continuous Days and until the minimum specified compressive strength is obtained.

.2 When the ambient temperatures are anticipated to be -15 °C or lower then insulation providing an R value of not less than 20, may be used to protect concrete providing weather conditions and insulation procedures are such that the temperature of the surface of the concrete is maintained at a minimum of 10 °C and a maximum of 50 °C for a period of 7 continuous Days and until the minimum specified compressive strength is obtained.

.3 The proposed method of insulation shall be submitted to the Engineer for approval at least two weeks in advance of use.

.4 Insulating materials shall be kept dry.

302.4.9 .7 Withdrawal of Protection

.1 After completion of the specified curing period the temperature of the concrete shall be gradually reduced, at a rate not to exceed 5 °C per hour, to that of the surrounding air.

302.4 .10 Hot Weather Requirements

.1 For the purpose of this Specification hot weather shall be considered to be when the ambient temperature is at or above 25 °C, or in the opinion of the Engineer is likely to rise above 25 °C within the next 24 hours.

.2 Hot weather placing of concrete shall not proceed without the approval of the Engineer.

.3 The Contractor must demonstrate that he can provide adequate hot weather protection and agree to provide this protection before any approval can be given to start placing concrete.

.4 When the drying conditions meet moderate drying conditions or severe drying conditions as defined by CAN/CSA - A23.1, the drying protection must meet with the approval of the Engineer.

.5 The temperature of the formwork, reinforcing steel and material against which new concrete is to be placed shall not exceed 30 °C.

.6 The mixing water and/or aggregates shall be cooled when the temperature of the mix exceeds 25 °C.

.7 Exposed surfaces of concrete shall be shaded from the direct rays of the sun and sheltered from direct wind.

302.4 .11 Finishing Hardened Concrete

302.4.11 .1 General

.1 The following concrete surfaces shall receive a "High Quality Surface Finish":

  .1 Abutment endposts, barrierwalls, and outside edges of the deck.

  .2 Columns and cap beams.

  .3 Vertical faces and bottom side of rigid frame grade separation Structures.

  .4 Safety curbs and sidewalks with exposed concrete surfaces.

.2 All other concrete surfaces shall receive an "Ordinary Surface Finish" unless otherwise directed by the Engineer.

.3 The Contractor shall cast, for a barrierwall, a site reference panel 3 m in length.

  .1 The panel shall be cast in the same orientation, with the same formwork material and reinforcing that will be incorporated into the Work.

  .2 The panel shall be cast with the same concrete mix and method of placement, curing and protection that will be applied for the barrierwalls.

.3 Once the reference panel is accepted, it will remain on-site for the purpose of comparison in assessing compliance of the high quality finish for the barrierwalls.

  .4 The Contractor shall be responsible for the removal and disposal of the site reference panel, outside of the Work Site.

.4 For components other than barrierwalls, the Contractor and the Engineer shall jointly select an area of the component and the Contractor shall finish the area such that the area is acceptable to the Engineer.

  .1 The selected finished area shall be used for comparison purposes in assessing compliance with the finish required for the component.

302.4.11 .2 Defects

.1 Immediately after the removal of forms any part of the Work which displays defects shall be clearly marked and the Contractor shall notify the Engineer of the location and extent of the defect for his review.

  .1 The Contractor shall submit a repair procedure for approval.

    .1 Cement washes of any kind shall not be used.

    .2 All defects shall be finished smooth, uniformly colour matched and flush with the adjacent surface.

302.4.11 .3 Ordinary Surface Finish

.1 All surface voids larger than 12 mm in diameter and cavities or holes visible upon the removal of the formwork, shall be filled to their entire depth, with an approved cement grout mix of cement and fine sand from the same source as used in the concrete and incorporate a latex bonding agent.

.2 All objectionable fins, projections, offsets, streaks or other surface imperfections shall be totally removed to the Engineer's satisfaction.

.3 If the concrete surface does not adequately fulfil the requirements for Ordinary Surface Finish, the Contractor shall, as directed by the Engineer, entirely remove certain designated portions, or all of the concrete, and replace with new concrete.

302.4.11 .4 High Quality Surface Finish

.1 Prior to finishing, and without defacing the surface, the Contractor shall pressure wash the surface to identify all air voids.

.2 The surface shall first be given an Ordinary Surface Finish as specified in 302.4.11.3.

.3 Small surface voids due to entrapped air shall be cleaned to remove surface laitance and filled, to their entire depth, with an approved cement grout mix of cement and fine sand from the same source as used in the concrete and incorporating a latex bonding agent.

.4 The entire surface shall be finished to produce a smooth dense surface of uniform colour without pits or irregularities.

302.4 .12 Quality Testing

302.4.12 .1 General

.1 The Contractor shall provide and maintain adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the initial curing period.

.2 Facilities shall be provided by the Contractor, for the Engineer to inspect all ingredients and processes used in the manufacture and delivery of concrete.

  .1 The Contractor shall provide a person to assist the Engineer in carrying out the sampling/testing during the concrete placement.

.3 If the measured slump or air content falls outside the limits specified, a check test will be made immediately on another portion of the same sample.

  .1 This concrete load, in the event of a second failure, shall be considered to have failed to meet the requirements of this specification.

302.4.12 .2 Frequency of Testing

.1 Concrete Work shall be tested according to the schedule indicated in Table 302-4.

Table 302-4
Frequency of Testing (Concrete)

Number of Cubic Metres in Placing Operation	Minimum No. of Cylinders	Minimum No. of Tests See Note 1
up to 50	6	2
51 - 100	9	3
101 - 200	12	4
over 200	See Note 2	See Note 2

Note 1 A test is defined as 2 cylinders to be broken at the specified age. Cylinders shall be sampled in accordance with CSA A23.2-1C.

Note 2 An additional test shall be taken for each additional 100 cubic metres of concrete placed.

302.4.12 .3 Sampling Concrete

.1 Test specimens, used as a basis for acceptance of concrete, shall be made and cured to meet the requirements of CSA A23.2-3C.

  .1 Samples shall be obtained at the time of placement unless otherwise specified by the Engineer.

.2 Strength tests shall mean the average strength of two-companion 150 mm by 300 mm test cylinder specimens taken from the same batch and tested at the same age.

.3 Test specimens shall be tested at the age of 28 Days, unless otherwise specified, to meet the requirements of CSA A23.2-9C.

.4 To meet the strength requirements of this Item, the average of all tests shall exceed the specified strength.

  .1 When three or more tests of the same type of concrete are available, the average of any three consecutive tests shall be equal to or greater than the specified strength, and not more then one strength test in ten shall be less than 90% of the specified strength.

302.4.12.3 .5 If the results of tests indicate that the concrete is not of the specified strength, the Engineer shall have the right to require one or more of the following steps taken:

.1 changes in the mix proportions for the remainder of the Work;

.2 additional curing on those portions of the Structure represented by the test specimens that failed to meet specified requirements;

.3 non-destructive testing;

.4 that cores be drilled from the portions of the Structure in question and tested in accordance with CAN/CSA Test Method A23.2 - 14C, and evaluated on the basis of CSA A23.1-17;

.5 load testing of the Structure or structural elements in accordance with the requirements of CSA A23.3; and

.6 such other tests as the Engineer may specify.

.6 If the concrete in the Structure is not of the specified strength, the Contractor shall submit for the approval of the Engineer a proposal for the strengthening or replacement of those portions deemed to be unsatisfactory.

.7 Additional tests of cylinders, cured entirely under field conditions, may be required to check the adequacy of curing or cold weather protection.

.1 Test cylinders shall be stored as near as possible to the point in the Structure that the test cylinders represent, and shall be afforded the same temperature protection and moisture environment as the Structure.

.2 At the end of the curing period the test cylinders shall be left in place, exposed to the weather in the same manner as the Structure.

.3 All test cylinders shall be removed from the field storage and stored in lime water at 23 ± 2°C for 24 ± 4h immediately before time of testing to ensure uniform moisture conditions from cylinder to cylinder.

.8 If a 7-day compressive strength test falls below 70% of the minimum specified compressive strength, the Engineer may require changes to the concrete mix design, placement procedures, or other measures to increase the strength of the concrete.

.9 Density and Yield tests shall be made, as required by the Engineer, to meet the requirements of CSA A23.2-6C.

.10 Slump tests shall meet the requirements of CSA A23.2-5C.

.11 Air content tests shall meet the requirements of one of the following CAN/CSA (1) A23.2-4C or (2) A23.2-7C.

.12 Concrete temperature tests shall meet the requirements of ASTM C1064.

302.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the specified volume, measured in cubic metres, of concrete supplied, placed and finished in accordance with this Item.

  .1 The volume shall be the lesser of the computed volume of concrete as determined from the design dimensions presented in the Contract Documents or the actual volume of concrete placed.

  .2 On concrete rehabilitation, the volume shall be the actual quantity of concrete placed.

    .1 For beam supported concrete deck slabs the computed volume of concrete in Structures "D" shall include the concrete calculated based on the actual beam camber profile.

    .2 For footing and working slab concrete where Overexcavation in solid rock occurs payment shall be handled as follows:

      .1 For Overexcavation down to a maximum of 150 mm below the specified elevation of the bottom of the footing the computed volume of the footing concrete will be determined from design plan footing dimensions presented in the Contract Documents and the average depth of the footing.

      .2 For Overexcavation in excess of 150 mm below the specified elevation of the bottom of the footing, the width and length of the working slab concrete will be as shown on Standard Drawing 302-3, and the average depth of the working slab will be determined from the bottom of the excavation up to the specified elevation of the bottom of the footing.

        .1 Concrete required to provide a working slab under footings will be paid at the Contractor's invoice price from the supplier.

  .2 The specified volume of tremie concrete for which payment will be made will be the volume contained within cofferdams assuming the theoretical horizontal dimensions as shown in the Contract Documents and the base and upper surface elevations as measured in the field and in accordance with 302.4.5.3.

.2 Measurement of concrete in Structures, calculated on the dimensions shown in the Contract Documents, will not be affected by the formwork tolerances listed in Item 958.

302.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of concrete, as identified under the Contract.

.2 The Owner will make partial payment in accordance with 908.7 for associated materials identified in 302.2.4.1.

302.6 .3 In the case that the Engineer initiates further testing in accordance with the requirements in 302.4.12.3.5 to determine if the specified strength has been attained, the following shall apply:

- .1 If the test results indicate that the specified strength has been attained, then the testing costs incurred by the Owner will be borne by the Owner.
- .2 If the test results verify that the specified strength has not been attained, then the testing costs incurred by the Owner shall be charged to the Contractor.
    - .1 The cost of any retesting to resolve the specified strength shall be borne by the Contractor.

304.1 DESCRIPTION

.1 This Item consists of supplying and placing of reinforcing steel.

304.2 MATERIALS

.1 All material shall be supplied by the Contractor.

.2 Reinforcing steel shall be designated as Reinforcing Steel "A" for non-coated reinforcing steel and Reinforcing Steel "B" for epoxy coated reinforcing steel.

.3 All reinforcing steel shall be new billet steel conforming to current CAN/CSA G30.18, "Billet Steel Bars for Concrete Reinforcement", Grade 400, with the following additional requirements:

  .1 For Grade R bars, the minimum elongation at rupture in a 200 mm gauge length shall be 12% for No. 25 bars and smaller, and 10% for No. 30 bars and larger.

  .2 For Grade R bars, the pin diameter for the 180° bend tests shall be 4 bar diameters for No. 25 bars and smaller, 6 bar diameters for No. 30 and No. 35 bars, and 8 bar diameters for No. 45 and No. 55 bars.

  .3 Reinforcing steel shall be in the form of deformed round bars unless otherwise noted in the Contract Documents.

  .4 Reinforcing steel shall be free of physical defects.

  .5 Spiral bars in pier shafts shall be Grade W bars.

.4 The supply of epoxy coated reinforcing steel and the finished installed steel reinforcing bars shall conform to the requirements of ASTM D3963 and Annex A1.

  .1 The epoxy coating material shall conform to ASTM D3963 - Annex A1.

.5 Reinforcing steel shall be bent to proper shape in a plant having suitable devices for bending reinforcing steel as recommended in The Reinforcing Steel Institute of Canada, (RSIC), Manual of Standard Practice, unless otherwise noted in Contract Documents.

  .1 Heating shall not be used as an aid in bending steel, unless specifically authorized by the Engineer.

.6 Welding or splicing shorter bars as a substitute for supplying bars of the specified lengths shall not be permitted.

.7 Bars are subject to rejection if their actual weight varies from their theoretical weight, as specified in CAN/CSA G30.18, Grade 400, by more than 5%.

.8 All Structures are designed using Metric (SI) reinforcing steel bar sizes and the Contractor shall supply accordingly.

304.3 SUBMITTALS

.1 The Contractor shall submit, the manufacturer's certification that the materials supplied meet the specified requirements, at least 14 Days in advance of the commencement of the Work.

.2 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.

  .1 All welders shall be certified by the CWB to CAN/CSA W47.1 specifications, and/or to a certification level of Qualified Welder as issued by the Province of New Brunswick.

.3 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

304.4 CONSTRUCTION

304.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall handle and store the reinforcing steel in a manner that ensures it is not damaged or contaminated with dirt or other materials.

.3 Prior to delivery of reinforcing steel, bars or groups of bars shall be tagged in a durable fashion.

  .1 Tags shall indicate designation letters and number assigned to bars on the Plans.

.4 Reinforcing steel shall be stored on skids at least 150 mm above ground.

.5 Special care shall be taken when handling epoxy coated reinforcing steel so that damage to the coating is kept to a minimum.

  .1 On site storage of the epoxy coated reinforcing steel shall not exceed 120 Days, and direct exposure to sunlight shall not exceed 30 Days.

.6 The Contractor shall repair any damage to the epoxy coating prior to encasement of the reinforcing steel in concrete.

  .1 Patching material and procedures shall meet the requirements of ASTM D3963 and Annex A1.

  .2 All saw cut ends shall be coated.

304.4 .2 Placing and Fastening

.1 Immediately before placing, reinforcing steel shall be free of oil, dirt, mill scale, loose or excessive rust or other coatings that would reduce bond to concrete.

304.4.2.1 .1 Reinforcing steel shall be maintained in this clean condition until embedded in concrete and reinforcing steel about to be embedded in concrete shall be free of loose hardened concrete.

.2 Reinforcing steel shall be secured so it will remain in position during depositing and vibrating of concrete.

.3 The following conditions shall apply for epoxy coated reinforcing steel:

  .1 Epoxy coated reinforcing steel shall only be tied with tie wire that is coated with epoxy, plastic or nylon.

  .2 Bar supports shall be manufactured from a dielectric material or bar supports shall be coated with dielectric material such as epoxy or vinyl compatible with concrete.

  .3 The following conditions shall apply for field cutting of epoxy coated reinforcing steel:

    .1 Flame cutting of epoxy coated reinforcing steel is not permitted.

    .2 Saw cutting of bars in the field may only be done on the approval of the Engineer.

.4 All slab bolsters and chairs used for supporting and/or spacing reinforcing steel shall have heavy plastic tipped legs.

.5 The spacing of all slab bolsters and chairs shall be approved by the Engineer before they are placed in the Work.

  .1 Wood blocks will not be permitted as deposited spacers.

.6 Concrete shall not be deposited until reinforcing steel is held firmly in the position specified and the Engineer has inspected and approved the positioning and securing of the reinforcing steel.

.7 Plastic bar supports shall be used as chairs where the concrete surfaces are to be exposed to severe weathering, sea water, or de-icing salts.

  .1 Precast concrete blocks with embedded plastic coated wires or plastic bar supports shall be used for bar supports that are in contact with soil.

    .1 Precast concrete blocks shall consist of concrete of the same concrete mix designation as that specified for the member.

.8 Bars shall be fastened together at all intersections, except where the spacing is less than 300 mm in each direction in which case fastening at alternate intersections of each bar with other bars will be permitted provided the Contractor can demonstrate to the Engineer that this will hold all the bars securely in position.

304.4.2 .9 In deck slabs, the top bar on the top mat shall be tied securely to the stirrups of the precast prestressed concrete beam or the connectors on the steel beam.

.1 Spacing of the ties shall not exceed 900 mm centre along the entire length of the beams.

.10 The Contractor shall ensure that flexing of the reinforcing steel, partially embedded in fresh plastic concrete less than 36 hours old, due to any site condition, shall not occur.

.11 The Contractor shall not continue Work on partially embedded reinforcing steel until the previously placed concrete has been in place for a minimum of 36 hours.

304.4 .3 Welding

.1 Column spirals shall be lap welded, when so specified, using E480 Series low hydrogen electrodes and in accordance with the requirements of CAN/CSA W186.

.2 The welding of reinforcement, including tack welding, is prohibited unless otherwise indicated in the Contract Documents.

304.4 .4 Testing

.1 Additional reinforcing steel, required to replace that altered by testing, shall be provided by the Owner under the terms of this Item, unless the reinforcing steel is shown, by testing, to be in non-conformance with the Specifications, then the reinforcing steel shall be the responsibility of the Contractor.

304.4 .5 Tolerances

.1 Unless otherwise specified in the Contract Documents, reinforcing steel shall be constructed within tolerances listed in Table 304-1.

.2 The tolerances listed in Table 304-1 and those presented in Table 958-1 for formwork are not cumulative.

Table 304-1
Reinforcing Steel Tolerances

Fabrication Tolerances	Cutting to length		(+) 10 mm, (-) 25 mm	
	Hooked bars	out-to-out of hooks	for No.25 bars or smaller	± 10 mm
			for bars larger than No.25	± 25 mm
	Spirals or circular ties	out-to-out dimension	± 5 mm	
	Column ties or stirrups	out-to-out dimension	± 5 mm	

continued ...

304.4.4.5 **Table 304-1 cont'd**

Placing Tolerances	Reinforcing steel shall be placed in specified positions within the following tolerances unless otherwise noted in the Contract Documents:		
	Where the depth (d) of a flexural member, the thickness of a wall or slab or the smallest dimension of a column is :		
	200 mm or less		± 3 mm
	200 mm to 750 mm		± 6 mm
	more than 750 mm		± 10 mm
	Longitudinal locations of bends and ends of bars	except where specified concrete cover at ends of members shall not be reduced	± 25 mm

Spacing Tolerances	Reinforcing steel shall be spaced at the specified spacing within the following tolerances unless otherwise noted in the Contract Documents		
	Footings		± 10 mm
	Columns	notwithstanding the stated tolerance, all column bars must be in contact with spirals in round columns, and must be in contact with stirrups and in corners of stirrups for rectangular columns	± 10 mm
	Deck bars and walls		± 10 mm
	Tee beams	notwithstanding the stated tolerance, all bars must be in contact with stirrups and in the corners and hooks	± 10 mm

Bar Cover Tolerances		± 10 mm

304.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of kilograms of reinforcing steel supplied and placed in accordance with this Item.

304.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of reinforcing steel, as identified under the Contract.

.2 The Owner will make partial payment for reinforcing steel in accordance with 908.7.

.3 The cost of the provision of materials, labour and Equipment to test the reinforcing steel to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the material does not meet the Specifications, otherwise the Owner shall bear the cost of the test.

  .1 The cost of any retesting to resolve the supply of the specified reinforcing steel shall be borne by the Contractor.

305.1 DESCRIPTION

.1 This Item consists of the splicing of reinforcing steel bars.

305.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Tension reinforcing bar connections shall be able to develop a minimum of 125% of the yield stress of the bars being spliced.

.3 Materials shall be stored in a weatherproof enclosure.

305.3 SUBMITTALS

.1 The Contractor shall submit the name of the supplier and the manufacturer/supplier's recommended installation procedures at least 14 Days in advance of the Work.

.2 When requested, the Contractor shall submit the manufacturer's recommended procedures for installation and instructions.

305.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The preparation and installation of the splice shall be in accordance with the manufacturer's instructions.

  .1 The Contractor, upon request, shall make available, at the site, a representative of the supplier to ensure that preparations and installation procedures are as recommended by the manufacturer.

.3 The Engineer reserves the right to test any or all splices.

305.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tension splices constructed in accordance with this Item.

305.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

.2 The Owner will make partial payment for tension splices in accordance with 908.7.

.3 The cost of the provision of materials, labour and Equipment to test the tension splices to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the splice does not meet the Specifications, otherwise the Owner shall bear the cost of the test.

  .1 The cost of any retesting to resolve the adequacy of the tension splice shall be borne by the Contractor.

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311.5 MEASUREMENT FOR PAYMENT 311-11

311.6 BASIS OF PAYMENT 311-11

311.1 DESCRIPTION

.1 This Item consists of the installation of steel H piles and the supply and installation of cap plates and pile points.

311.2 MATERIALS

.1 The steel H piles shall be made available by the Owner from stock at DOT Fredericton, NB.

  .1 Steel H piles shall be in accordance with the requirements of CAN/CSA G40.20/G40.21, Grade 300W and the stock lengths may vary from 6 to 18 metres depending on available stock at the time of the Contract.

.2 All other materials shall be supplied by the Contractor.

.3 Steel used for pile cap plates shall meet the requirements of CAN/CSA G40.21, Grade 300W.

311.2 .4 Cap plates and pile points for HP 310x79, HP 310x132 and HP 360x132 piles shall be supplied as shown on Standard Drawing 311-1 and 311-2.

.1 Where there is another pile size indicated in the Contract Document, the Contractor shall supply the pile points and the respective pile cap plates fabricated in accordance with the details presented in the Contract Documents.

.5 Piles shall be stored in an organized, straight and horizontal fashion to avoid permanent distortion. Caps and points shall be acceptably stored on pallets or blocked at least 150 mm off the ground.

.6 Electrodes for the Shielded Metal Arc Welding (SMAW) process shall be certified to CAN/CSA W48.1 and shall be basic (low hydrogen) electrodes E48016 or E48018.

.7 Electrodes for the Flux Cored Arc Welding (FCAW) process shall be certified to CSA W48.5-E4801T-X-CH with a minimum Charpy V-Notch Impact Property equal to 27 Joules at –30 °C.

311.3 SUBMITTALS

.1 The Contractor shall submit, at least 7 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements.

.2 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.

.1 All welders shall be certified by the CWB to CAN/CSA W47.1 specifications, and/or to a certification level of Qualified Welder as issued by the Province of New Brunswick.

.3 The Contractor shall submit, for approval by the Engineer, the proposed electrodes for the FCAW process.

.4 The Contractor shall submit, for approval, at least 14 Days in advance of any pile installation, a detailed description and drawing of the proposed driving system(s) including, the manufacturer's specifications for the hammer and driving system including the leads proposed.

.1 The submission shall provide the full details of characteristics necessary to evaluate performance, including but not limited to the manufacturer's name, type of hammer, rated energy per blow at the normal working rate, the mass of the striking parts of the hammer, the mass of the driving cap and the type and elastic properties of the hammer and pile cushion materials.

.2 The submission shall also include, but not be limited to, the following minimum requirements:

.1 The leads employed shall be supported independent of the pile.

.2 Impact of the pile driving hammer shall be axial and square with respect to pile axis.

.3 Leads shall be immobile during hammer operation but shall be capable of adjustment to accommodate changing the centre of gravity of the driving system during driving.

311.3 .5 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

311.4 CONSTRUCTION

311.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work with a pile driving system(s) capable of developing the capacity as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.3 The Contractor shall install all cap plates and pile points, in accordance with the details presented on Standard Drawings 311-1 and 311-2.

.4 The Contractor shall splice the pile sections in accordance with the Standard Drawings 311-3, 311-4 and 311-5 and at the approved locations to meet the Work requirements in accordance with this Item.

311.4 .2 Pile Installation

.1 The installation of each pile shall be subject to the approval of the Engineer who shall be the sole judge of the acceptability of each pile with respect to the final driving resistance, depth of penetration or other criteria used to determine the capacity of the pile.

.2 The Contractor shall ensure that the piles are installed in accordance with the specified criteria, provided by the Engineer and based on the Contractor's approved driving system(s).

  .1 During driving, pile heads showing evidence of damage such as curled flange tips which indicate that the pile stiffness is compromised, shall be trimmed immediately prior to finalizing, and immediately prior to each retapping sequence.

    .1 When the pile damage is evident only after removal of the hammer from the pile, the pile head shall be trimmed and the pile redriven to the specified capacity.

    .2 If, in the opinion of the Engineer, the pile head damage results in unnecessary loss of Owner supplied material, or causes excessive uncertainty in estimating pile capacity; and is a result of misaligned, worn, or poorly fitting driving equipment, or improper pile driving technique; the Contractor shall adjust, modify or replace the driving equipment or methods so that further damage does not occur.

.3 Followers shall only be used with the expressed written consent of the Engineer.

311.4.2 .4 The first pile driven at any pile group location shall be driven to finalization, prior to commencing the driving of other pile(s) within the same group.

.5 Any piles which become displaced as the result of the driving of adjacent piles shall be retapped to re-establish the finalization criteria and the specified capacity.

.6 Piles which are subject to relaxation shall be retapped and/or driven until it can be demonstrated that the permanent pile capacity meets or exceeds the specified capacity.

  .1 All retaps shall be conducted with a hammer warmed by applying a minimum of 20 blows on a pile other than the pile to be tested or any adjacent piles.

  .2 Retaps shall not be carried out within 24 hours of the end of the previous driving of that pile or any adjacent pile(s) within a clear distance of 3 m and forming part of the group.

  .3 Retaps shall, as a minimum, advance the pile a distance of 150 mm or reach a total of 50 blows whichever occurs first.

  .4 Retaps shall continue until 120% of the specified pile capacity has been achieved and upon retap this value does not fall below 100% of the specified pile capacity.

  .5 The Contractor shall keep detailed field notes on all retapping tests to confirm that the above provisions have been met, prior to cutting the piles to final grade.

.7 The Contractor shall ensure that a minimum of 500 mm of pile length remains above the specified cut-off elevation after finalization and the Contractor shall cut all piles at the specified grade in a horizontal plane only after finalization of the pile has been approved by the Engineer.

311.4 .3 Pile Installation Tolerances

.1 The Contractor shall ensure that the pile remains within the specified tolerances throughout the entire length of the driven pile.

.2 All piles shall be driven with a variation of not more than 10 mm/m from vertical or from the batter specified in the Contract Documents.

.3 In no case shall the total variation exceed 100 mm from the specified location.

.4 Pile tolerances shall be measured at the ground line and at the cut-off elevation and in no cases shall piles be loaded horizontally to move the pile within the specified tolerances.

.5 For piles outside the specified tolerances, the Contractor shall submit a report, for the approval of the Engineer, stamped and signed by a Professional Engineer registered or licensed to practice in the Province of New Brunswick, detailing the findings and, if required, any corrective measure(s) to remedy the Work.

  .1 The Contractor shall carry out all remedial Work.

311.4 .4 H Pile Splices, Cap Plate and Pile Point Connections, and Welds

.1 Welding of field and shop splices for steel H piles, cap plate and pile point connections shall be by the SMAW or FCAW process.

.2 The Engineer may request to have the welder tested or approved on the welding procedures outlined in the Specifications.

.3 Basic electrodes of E480 classification that are not used within 4 hours after removal from ovens shall be dried for at least one hour at a temperature between 370 °C and 430 °C before being used.

.4 Roughness of oxygen cut surfaces shall not be greater than that defined by the ANSI Surfaces Roughness Value of 1000.

  .1 Roughness exceeding this value and occasional notches or gouges, not more than 5 mm deep on otherwise satisfactory surfaces, shall be removed by machining or grinding.

  .2 Oxygen cut surfaces and edges shall be left free of adhering slag.

  .3 Corrections of defects shall be flared to the oxygen cut surface with a Slope not exceeding 1 in 10.

.5 Defects of oxygen cut surfaces shall not be repaired by welding except with the express approval of the Engineer for correction of occasional notches or gouges less than 10 mm deep.

  .1 These weld repairs shall be made by suitably preparing non-conforming surfaces, welding with basic electrodes not exceeding 4 mm in diameter, observing applicable SMAW requirements of 311.4.5 and grinding the completed weld smooth and flush with adjacent surface to produce a satisfactory finish.

.6 Joint Profiles shall be as detailed on Standard Drawings 311-3, 311-4 and 311-5.

.7 The workmanship of the assembly shall meet the standards of CAN/CSA W59.

.8 Welding of steel made of CAN/CSA G40.21, Grade 300W of 20 mm thickness and under, shall not require preheating when base metal temperature is above 0° C.

  .1 When base metal temperature is 0 °C or lower, the base metal shall be preheated to at least 10 °C and maintained at a minimum temperature of 10 °C during welding.

.9 Steel over 20 mm shall be preheated to 10 °C before any welding is done.

.10 No welding shall be done when the ambient temperature is lower than -18 °C.

.11 The preheating zone shall be a minimum of 75 mm on each side of the joint.

311.4.4 .12 Protection shall be provided for welding under adverse weather conditions of wind and/or precipitation.

.1 All methods of protection shall be subject to the approval of the Engineer prior to any welding being carried out.

.13 No pile shall be driven until the welded joint has been inspected and approved by the Engineer.

.14 When piles have been welded within a heated enclosure during cold weather, the pile shall not be removed from this enclosure until the welded joint has cooled so that it is warm to the bare hand.

311.4 .5 Procedures for Shielded Metal Arc Welding And Flux Cored Arc Welding

311.4.5 .1 General

.1 The details of welding procedure, workmanship and technique shall conform to CAN/CSA W59.

.1 The design and construction provisions for Dynamically Loaded Structures of Clause 12 of CAN/CSA W59 shall apply.

.2 The Work shall be positioned for flat position welding whenever practical.

.3 When welding in vertical positions progression for all passes shall be upward.

.4 Before welding over previously deposited metal, slag shall be removed and welds and adjacent base metal shall be brushed clean.

.1 This requirement shall apply not only to successive layers but also to successive beads and to the crater area when welding is resumed after interruption.

.5 Classification and size of electrodes, arc length, voltage and amperage shall be suitable for thickness of material, type of groove, welding positions and other circumstances pertaining to the Work.

.1 Welding current shall be within the range recommended by the electrode manufacturer.

.6 For SMAW, the maximum size of electrode, the maximum thickness of layers and the maximum size of one-pass fillets shall be as indicated in Table 311-1.

Table 311-1
Criteria for Prequalified Joints using the SMAW Process

Maximum size of Electrode	4 mm ϕ	All passes in vertical fillet and groove welds
	5 mm ϕ	All passes in overhead fillet and groove welds
		All passes in horizontal groove welds
		Root passes in grooves with backing where the root opening is less than 6 mm in flat position
		Root passes in grooves without backing in flat position
	6 mm ϕ	All passes for horizontal fillet welds
		Root passes for fillets in flat position
		Root passes in grooves with backing where the root opening is greater than 6 mm in flat position
	8 mm ϕ	All passes subsequent to root passes for fillet and groove welds made in the flat position

Maximum Thickness of Layers	6 mm	For root passes of groove welds with the minimum size being such as to prevent cracking
	5 mm	For subsequent layers of welds made in any position

Maximum One-pass Fillet	10 mm	In the flat position
	8 mm	In the horizontal or overhead positions
	12 mm	In the vertical position

311.4.5.1 .7 For FCAW the maximum size of electrode, the maximum thickness of layers and the maximum size of one-pass fillets shall be as indicated in Table 311-2.

Table 311-2
Criteria for Prequalified Joints using the FCAW Process

Maximum size of Electrode	4 mm ϕ	All passes in flat and horizontal positions
	2.4 mm ϕ	For the vertical position
	2.0 mm ϕ	For the overhead position

Maximum Thickness of Layers	6 mm	All weld layers except for root and surface layers A multiple pass, split-layer technique shall be used in making all multiple pass welds when the width of the layer exceeds 22 mm

Maximum One-pass Fillet weld	12 mm	In the flat and vertical positions
	10 mm	In the horizontal position
	8 mm	In the overhead position

311.4.5 .2 Details

.1 Butt joint groove welds except those produced with the aid of backing shall have the root of the initial weld air carbon-arc gouged, chipped or ground to sound metal before welding is started from the second side.

  .1 Particular care shall be taken in the gouging, chipping or grinding operation so that the remaining weld metal or base metal is not nicked or undercut.

  .2 Defective portions of the weld shall be removed without substantial removal of the base metal.

.2 Groove welds made with the use of backing shall have the weld metal thoroughly fused with the backing.

.3 Steel H pile splice groove welds shall be terminated at ends of a joint in a manner to ensure sound welds by use of extension bars or runoff tabs.

  .1 Extensions shall be removed upon completion and cooling of the weld, and the ends of the weld made smooth and flush with the edges of the abutting parts.

.4 When tack welds are used for alignment, care shall be exercised by properly grinding or preparing stops and starts to make continuous welding satisfactory.

.5 Flux, pin holes, craters, visual surface defects and excessive crown shall be removed before depositing the next layer of weld.

.6 Stringer beads shall be used for horizontal welds.

311.4 .6 Inspection of Welds

311.4.6 .1 Inspection and Testing of Welds

.1 The procedure and technique for visual and non-destructive testing shall be in accordance with CAN/CSA W59, Clauses 7 and 8.

.2 Inspection and Testing Organizations shall demonstrate to the Engineer that the methods they propose to use for non-destructive testing are suitable, and meet one of the following requirements:

  .1 The methods for non-destructive testing shall be as approved by the Province of New Brunswick.

  .2 The Welding Inspection Organization shall be certified to CAN/CSA W178, Qualification Code for Welding Inspection Organizations.

.3 Guided bend tests shall be carried out on coupons in accordance with CAN/CSA W47.1 Section 8.5 and will be tested by the Engineer.

  .1 Runoff tabs required for bend tests shall be made of the same material and thickness as the H pile.

311.4.6.1.3

.2 Guided bend test coupons may be taken from the actual pile splice by removing the coupon from a steel H pile splice.

.3 If the Engineer determines that a guided bend test coupon fails to meet the standard, he may then test sufficient coupons as he feels are necessary to provide assurance that the balance of the welding is satisfactory.

.4 The preparation of these test coupons shall be done by the Contractor before the pile splice is driven below the ground.

.5 The Contractor shall restore the pile to its original condition, if the weld is acceptable.

.6 The length of the weld on 75 mm long runoff tabs shall be a minimum of 65 mm.

311.4.6 .2 Frequency of Inspection and Testing

.1 All welds shall be inspected visually.

.2 Testing shall be carried out by the Engineer as follows:

  .1 A minimum of 25% of full penetration groove welds and steel H pile splices shall be tested by non-destructive testing methods (radiographic and/or ultrasonic test methods and supplemented by magnetic particle or liquid penetrant test methods as required) to assure the soundness and quality level of the welds.

  .2 A minimum of 25% of fillet welds shall be tested by non-destructive testing methods (magnetic particle and/or liquid penetrant test methods) to assure the soundness and quality level of the welds.

  .3 Welds in steel H pile splices may also be tested by guided bend tests on specimens made from a portion of field spliced material removed from the H pile.

    .1 These specimens shall have the backing removed by mechanical means or by flame cutting to within 3 mm of its thickness followed by grinding or machining.

    .2 All guided bend test coupons shall be stamped by the welder.

    .3 Non-destructive testing may be performed on coupons in lieu of guided bend tests.

  .4 If defects are identified that are outside the criteria specified in 311.4.6.3, the Engineer shall determine the additional percentage of testing that will be carried out to ensure the soundness and quality level of all the welds.

  .5 All corrected welds are to be retested.

311.4.6 .3 Quality of Welds

.1 The quality of welds in steel H pile splices shall be in accordance with CAN/CSA W59, Section 12, clause 12.5.4.

.2 The acceptance criteria for defects shall be in accordance with CAN/CSA W59 clause 12.5.4 and shall meet the limits described in this clause for tension welds.

.3 The quality of weld required for guided bend tests shall be in accordance with CAN/CSA W47.1, clauses 8.5 and 8.6.

311.4 .7 Dynamic Pile Testing

.1 Piles, as identified in the Contract Documents and/or as specifically directed by the Engineer, shall be dynamically tested during driving for measurement and estimation of mobilized resistance, hammer performance, pile stress and soil dynamic properties at the end of initial driving and during all retaps.

.2 The Engineer, based on the results of dynamic testing and analysis, will determine the pile acceptance criteria.

.3 The Contractor shall notify the Engineer at least 7 Days in advance of the pile driving operations.

.4 The Contractor shall assist the Engineer in carrying out the testing.

.5 The testing procedure will be carried out in accordance with AASHTO T298-99.

.6 The Contractor shall provide the Engineer with reasonable means of access to the pile for attaching instruments, with the pile in the leads.

  .1 The Contractor shall provide a work platform, minimum size of 1.2 m by 1.2 m, capable of being raised to the top of the pile.

  .2 The Engineer will require approximately one hour per pile, per test, to attach the instruments.

.7 The Contractor shall supply an electrical power supply of 20 Ampere, 115 Volts, 60 Hz, AC, for use by the Engineer during the tests.

  .1 Field generators shall be equipped with functioning voltage and frequency meters, and shall only supply electrical power for the pile testing.

.8 The Contractor shall provide the Engineer with access for a motor vehicle (van) within 15 m of the pile test or a shelter within the same distance.

  .1 The shelter shall have a minimum floor size of 2.5 m by 2 m, a minimum ceiling height of 2 m, and the interior temperature shall be maintained above 10 °C.

311.4.7 .9 With the dynamic testing equipment attached to the pile, the Contractor shall drive to end of initial driving and retap the pile with a hammer of the specified size, as directed by the Engineer.

.10 Stresses in the pile will be monitored during driving to ensure that the stresses do not exceed 90% of the pile steel yield stress.

.1 If directed by the Engineer, the Contractor shall reduce the driving energy delivered to the pile by means of cushion or helmet modifications, or by reducing the energy output of the hammer.

.2 If non-axial driving is indicated by the measurements, the Contractor shall immediately realign the driving system.

311.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of piles, installed in accordance with this Item.

.2 All piles shall be measured for payment only after all piles in any group or in close proximity to any other pile have been finalized and no further driving in the pile group will be required.

.3 The length to be measured for payment shall be the difference between the design cut-off elevation and the actual field toe elevation measured along the centerline axis of the pile.

.4 The Quantity of splices to be measured for payment shall be the number of approved splices fabricated in accordance with this Item.

.1 The Owner reserves the right to specify the number of splices to ensure the economical use of materials as well as to limit the amount of waste in pile cut-offs.

311.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of steel H pile, as identified under the Contract.

.2 The Owner will make partial payment in accordance with 908.7 for steel H pile stored at the Work Site.

.3 Splices, approved by the Engineer, shall be paid in accordance with Item 810.

.4 The cost of the provision of materials, labour and Equipment to test the welds shall be borne by the Contractor if the test results show that the material does not meet the specified requirements, otherwise the Owner shall bear the cost of the test.

.1 The cost of any testing to resolve the quality of welds shall be borne by the Contractor.

.5 Retapping in excess of four operations, if required, shall be paid for in accordance with Item 812.

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312.5 MEASUREMENT FOR PAYMENT 312-14

312.6 BASIS OF PAYMENT 312-14

312.1 DESCRIPTION

.1 This Item consists of the supply and installation of steel pipe piles, including splicing as required, and the supply and installation of pile points.

312.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Steel pipe piles shall be nominal 500 mm OD with 13 mm wall thickness conforming to ASTM A252, Grade 3 or as otherwise indicated in the Contract Documents.

312.2 .3 Pile points shall be supplied as shown on Standard Drawing 312-1 and the steel used for pile points shall meet the requirements of CAN/CSA G40.21 Grade 300W.

.4 Piles shall be stored in an organized, straight and horizontal fashion with the bottom tier being blocked at least 150 mm off the ground and stickers placed between the tiers. Points shall be acceptably stored on pallets or stored at least 150 mm off the ground. Nylon or canvas slings shall be used to handle the pipe piles.

.5 Electrodes for Shielded Metal Arc Welding (SMAW) process shall be certified to CAN/CSA W48.1 and shall be basic (low hydrogen) electrodes E48016 or E48018.

.6 Electrodes for the Flux Cored Arc Welding (FCAW) process shall be certified to CSA W48.5-E4801T-X-CH with a minimum Charpy V-Notch Impact Property equal to 27 Joules at –30 °C.

.7 The protective coating shall meet the requirements of CAN/CGSB-1.171 for inorganic zinc coatings and CAN/CGSB-1.184 for coal tar epoxy coatings.

.8 The coal tar epoxy coating shall be compatible with the inorganic zinc coating.

312.3 SUBMITTALS

.1 The Contractor shall submit, at least 7 Days in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements.

.2 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.

  .1 All welders shall be certified by the CWB to CAN/CSA W47.1 specifications, and/or to a certification level of Qualified Welder as issued by the Province of New Brunswick.

.3 The Contractor shall submit, for approval by the Engineer, the proposed electrodes for the FCAW process.

.4 The Contractor shall submit, prior to the commencement of the inorganic zinc coating Work, certification from the manufacturer of the inorganic zinc coating stating that the proposed method, Equipment, and materials used in the blast cleaning are acceptable.

.5 The Contractor shall submit, for approval, at least 14 Days in advance of any coating application, the applicator's name and schedule of Work.

  .1 The method of repair of a coating shall be submitted for approval 7 Days in advance of the repair.

.6 The Contractor shall submit, for approval, at least 14 Days in advance of any pile installation, a detailed description and drawing of the proposed driving system(s) including, the manufacturer's specifications for the hammer and driving system including the leads proposed.

312.3.6 .1 The submission shall provide the full details of characteristics necessary to evaluate performance, including but not limited to the manufacturer's name, type of hammer, rated energy per blow at the normal working rate, the mass of the striking parts of the hammer, the mass of the driving cap and the type and elastic properties of the hammer and pile cushion materials.

.2 The submission shall also include, but not be limited to, the following minimum requirements:

  .1 The leads employed shall be supported independent of the pile.

  .2 Impact of the pile driving hammer shall be axial and square with respect to pile axis.

  .3 Leads shall be immobile during hammer operation but shall be capable of adjustment to accommodate changing the centre of gravity of the driving system during driving.

.7 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

312.4 CONSTRUCTION

312.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work with a pile driving system(s) capable of developing the capacity as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.3 The Contractor shall fabricate and install all pile points, in accordance with the details presented on Standard Drawing 312-1.

.4 The Contractor shall splice the pile sections in accordance with Standard Drawing 312-2 and at the approved locations to meet the Work requirements in accordance with this Item.

.5 The Contractor must take special care during handling and driving operations to minimize damage to the pile protective coatings.

  .1 Any damage done to the coatings of the pipe pile casings shall be repaired to the satisfaction of the Engineer prior to driving the pile.

312.4 .2 Protective Coating System

312.4.2 .1 General

.1 Steel pipe piles shall be supplied with a protective coating system, consisting of an application of inorganic zinc coating, and coal tar epoxy coating.

  .1 All Work shall be performed in a heated weatherproof enclosure.

  .2 Each coating shall be cured in accordance with the manufacturer's recommendations prior to transport.

312.4.2 .2 Surface Preparation

.1 The exterior of all steel pipe piles shall be blast cleaned to conform to SSPC - SP5 - No. 5, White Metal Blast Cleaning.

.2 The blasting medium (silica sand, grit or shot) used shall be of a size that produces a surface profile acceptable to the manufacturer of the inorganic zinc coating being used.

  .1 No cleaning shall be carried out when the surface of the steel pipe pile casings are damp.

  .2 The blasted surfaces must be coated with inorganic zinc coating before any rusting occurs.

  .3 Under no circumstances are blast cleaned surfaces to be left uncoated overnight.

  .4 If the blast cleaned areas become damp, these surfaces shall be re-blasted to white metal after drying.

.3 All surfaces shall be free of dust, dirt, moisture, oil or grease prior to the application of a coating.

312.4.2 .3 Inorganic Zinc Coating

.1 The inorganic zinc coating shall be mixed and applied to the white metal surface with airless spray equipment and cured at the proper temperature for the minimum curing period, in accordance with the manufacturer's recommendations.

.2 The inorganic zinc coating shall be applied to obtain a dry film thickness of 60 μm (one coat) with tolerance of ± 5 μm.

.3 Before applying the inorganic zinc coating, the coating applicator will be required to tape 75 mm on each end of the steel piles to facilitate pile splicing in the field.

  .1 The inorganic zinc coating shall be applied to the splice and the taped area in accordance with this Item.

312.4.2 .4 Coal Tar Epoxy Coating

.1 A coal tar epoxy coating shall be applied over the inorganic zinc coating on the steel pipe piles.

.2 The coal tar epoxy shall have dry film thickness of 400 μm and shall be applied and cured in accordance with the coal tar epoxy manufacturer's recommendations.

.3 Before applying the coal tar epoxy coating, the coating applicator will be required to tape 150 mm on each end of the steel piles to facilitate pile splicing in the field.

  .1 The coal tar epoxy coating shall be applied to the splice and the taped area in accordance with this Item.

.4 If a post-cured inorganic zinc coating is used, no coal tar epoxy shall be applied to the inorganic zinc coated pipe pile until all curing solution has been removed in accordance with the recommendations of the manufacturer of the coatings.

312.4.2 .5 Inspection of Coatings

.1 Each Day's Work will be inspected by the Engineer not later than the Day following application of the coatings.

.2 Blast cleaned surfaces are to be approved by the Engineer before the commencement of the inorganic zinc coating application.

.3 Inspection of the completed coatings will be based upon Elcometer or other magnetic detector readings.

  .1 Inadequately coated sections and areas requiring re-coating shall be identified by the Engineer.

  .2 If such areas are close together, the Engineer may require re-coating of the entire zone.

  .3 The re-coated zone shall be re-inspected and shall meet the approval of the Engineer.

.4 Where rejection of a coating is due to poor workmanship or similar deficiency in the quality of the Work or materials, the Contractor shall remove the entire defective section of all previously applied material prior to re-application.

.5 At the discretion of the Engineer, an occasional spot test may be made using a sharp chisel (or other means) to remove a small section of the coating to physically gauge the coating thickness as a "proof test".

  .1 Where such tests are made, the areas shall be recoated.

312.4 .3 Pile Installation

.1 The installation of each pile shall be subject to the approval of the Engineer who shall be the sole judge of the acceptability of each pile with respect to the final driving resistance, depth of penetration or other criteria used to determine the capacity of the pile.

.2 The Contractor shall ensure that the piles are installed in accordance with the specified criteria, provided by the Engineer and based on the Contractor's approved driving system(s).

- .1 During driving with an external hammer, pile heads showing evidence of damage such as curled pipe wall which indicate that the pile stiffness is compromised, shall be trimmed immediately prior to finalizing, and immediately prior to each retapping sequence.
    - .1 When the pile damage is evident only after removal of the hammer from the pile, the pile head shall be trimmed and the pile redriven to the specified capacity.
    - .2 If, in the opinion of the Engineer, the pile head damage causes excessive uncertainty in estimating pile capacity; and is a result of misaligned, worn, or poorly fitting driving equipment, or improper pile driving technique; the Contractor shall adjust, modify or replace the driving equipment or methods so that further damage does not occur.
- .2 Immediately prior to internal driving a plug of dry concrete having a compacted height of 2.5 times the pile diameter shall be deposited in the base of the pile.
    - .1 The ratio of cement:stone:sand shall be 1:2:4, with a water-to-cementing materials ratio of 0.25.
    - .2 Driving shall be discontinued on a plug after 90 minutes from the time of mixing.
        - .1 After 90 minutes a smaller charge (50% of initial volume) of fresh concrete shall be added.

.3 Followers shall only be used with the express consent of the Engineer.

.4 The first pile driven at any pile group location shall be driven to finalization, prior to commencing the driving of other pile(s) within the same group.

.5 Any piles which become displaced as the result of the driving of adjacent piles shall be retapped to re-establish the finalization criteria and the specified capacity.

312.4.3 .6 Piles which are subject to relaxation shall be retapped and/or driven until it can be demonstrated that the permanent pile capacity meets or exceeds the specified capacity.

- .1 All retaps shall be conducted with a hammer warmed by applying a minimum of 20 blows on a pile other than the pile to be tested or any adjacent piles.

- .2 Retaps shall not be carried out within 24 hours of the end of the previous driving of that pile or any adjacent pile(s) within a clear distance of 3 m and forming part of the group.

- .3 Retaps shall, as a minimum, advance the pile a distance of 150 mm or reach a total of 50 blows whichever is less.

- .4 Retaps shall continue until 120% of the specified pile capacity has been achieved and upon retap this value does not fall below 100% of the specified pile capacity.

- .5 The Contractor shall keep detailed field notes on all retapping tests to confirm that the above provisions have been met, prior to cutting the piles to final grade.

.7 The Contractor shall ensure that a minimum of 500 mm of pile length remains above the specified cut-off elevation after finalization and the Contractor shall cut all piles at the specified grade in a horizontal plane only after finalization of the pile has been approved by the Engineer.

312.4 .4 Pile Installation Tolerances

.1 The Contractor shall ensure that the pile remains within the specified tolerances throughout the entire length of the driven pile.

.2 The Contractor shall be responsible to remove all foreign materials and water from within the entire length of the pile.

.3 All piles shall be driven with a variation of not more than 10 mm/m from vertical or from the batter specified in the Contract Documents.

.4 In no case shall the total variation exceed 100 mm from the specified location.

.5 Pile tolerances shall be measured at the ground line and at the cut-off elevation and in no cases shall piles be loaded horizontally to move the pile within the specified tolerances.

.6 For piles outside the specified tolerances, the Contractor shall submit a report, for the approval of the Engineer, stamped and signed by a Professional Engineer registered or licensed to practice in the Province of New Brunswick, detailing the findings and, if required, any corrective measure(s) to remedy the Work.

- .1 The Contractor shall carry out all remedial Work.

312.4 .5 Pipe Pile Splices, Pile Point Connections, and Welds

.1 Welding of field and shop splices for steel pipe piles and pile point connections shall be by the SMAW or FCAW process.

.2 The Engineer may request to test or otherwise have the welder approved on the procedures outlined in the Specifications.

.3 Basic electrodes of E480 classification that are not used within 4 hours after removal from ovens shall be dried for at least one hour at a temperature between 370 °C and 430 °C before being used.

.4 Roughness of oxygen cut surfaces shall not be greater than that defined by the ANSI Surfaces Roughness Value of 1000.

  .1 Roughness exceeding this value and occasional notches or gouges, not more than 5 mm deep on otherwise satisfactory surfaces, shall be removed by machining or grinding.

  .2 Oxygen cut surfaces and edges shall be left free of adhering slag.

  .3 Corrections of defects shall be flared to the oxygen cut surface with a Slope not exceeding 1 in 10.

.5 Defects of oxygen cut surfaces shall not be repaired by welding except with the express approval of the Engineer for correction of occasional notches or gouges less than 10 mm deep.

  .1 These weld repairs shall be made by suitably preparing non-conforming surfaces, welding with basic electrodes not exceeding 4 mm in diameter, observing applicable SMAW requirements of 312.4.6 and grinding the completed weld smooth and flush with adjacent surface to produce a satisfactory finish.

.6 The joint detail of the complete penetration groove weld for the butt joint in pipe piles shall be that shown on Standard Drawing 312-2.

.7 The workmanship of the assembly shall meet the standards of CAN/CSA W59.

.8 Welding of steel pipe piles shall not require preheating when base metal temperature is above 0 °C.

  .1 When base metal temperature is 0 °C or lower, the base metal shall be preheated to at least 10 °C and maintained at this minimum temperature during welding.

.9 No welding shall be done when the ambient temperature is lower than -18 °C.

.10 The preheating zone shall be a minimum of 75 mm on each side of the joint.

312.4.5 .11 No welding shall be done when there is a wind and/or when it is raining unless proper protection is provided.

- .1 All methods of protection shall be subject to the approval of the Engineer prior to any welding being carried out.

.12 No pile shall be driven until the welded joint has been inspected and approved by the Engineer.

.13 When piles have been welded within a heated enclosure during cold weather, the pile shall not be removed from this enclosure until the welded joint has cooled so that it is warm to the bare hand.

312.4 .6 Procedure for Shielded Metal Arc Welding and Flux Cored Arc Welding

312.4.6 .1 General

- .1 The details of welding procedure, workmanship and technique shall conform to CAN/CSA W59.
  - .1 The design and construction provisions for Dynamically Loaded Structures of Clause 12 of CAN/CSA W59 shall apply.
  - .2 The Work shall be positioned for flat position welding whenever practical.
  - .3 When welding in vertical positions progression for all passes shall be upward.
  - .4 Before welding over previously deposited metal, slag shall be removed and welds and adjacent base metal shall be brushed clean.
    - .1 This requirement shall apply not only to successive layers but also to successive beads and to the crater area when welding is resumed after interruption.
  - .5 Classification and size of electrodes, arc length, voltage and amperage shall be suitable for thickness of material, type of groove, welding positions and other circumstances pertaining to the Work.
    - .1 Welding current shall be within the range recommended by the electrode manufacturer.
  - .6 For SMAW, the maximum size of electrode, the maximum thickness of layers and the maximum size of one-pass fillets shall be as indicated in Table 312-1.

Table 312-1
Criteria for Prequalified Joints using the SMAW Process

Maximum size of Electrode	4 mm ϕ	All passes in vertical fillet and groove welds
	5 mm ϕ	All passes in overhead fillet and groove welds
		All passes in horizontal groove welds
		Root passes in grooves with backing where the root opening is less than 6 mm in flat position
		Root passes in grooves without backing in flat position
	6 mm ϕ	All passes for horizontal fillet welds
		Root passes for fillets in flat position
		Root passes in grooves with backing where the root opening is greater than 6 mm in flat position
	8 mm ϕ	All passes subsequent to root passes for fillet and groove welds made in the flat position

Maximum Thickness of Layers	6 mm	For root passes of groove welds with the minimum size being such as to prevent cracking
	5 mm	For subsequent layers of welds made in any position

Maximum One-pass Fillet	10 mm	In the flat position
	8 mm	In the horizontal or overhead positions
	12 mm	In the vertical position

312.4.6.1.1 .7 For FCAW the maximum size of electrode, the maximum thickness of layers and the maximum size of one-pass fillets shall be as indicated in Table 312-2.

Table 312-2
Criteria for Prequalified Joints using the FCAW Process

Maximum size of Electrode	4 mm ϕ	All passes in flat and horizontal positions
	2.4 mm ϕ	For the vertical position
	2.0 mm ϕ	For the overhead position

Maximum Thickness of Layers	6 mm	All weld layers except for root and surface layers A multiple pass, split-layer technique shall be used in making all multiple pass welds when the width of the layer exceeds 22 mm

Maximum One-pass Fillet weld	12 mm	In the flat and vertical positions
	10 mm	In the horizontal position
	8 mm	In the overhead position

312.4.6 .2 Details

.1 Butt joint groove welds except those produced with the aid of backing shall have the root of the initial weld air carbon-arc gouged, chipped or ground to sound metal before welding is started from the second side.

  .1 Particular care shall be taken in the gouging, chipping or grinding operation so that the remaining weld metal or base metal is not nicked or undercut.

  .2 Defective portions of the weld shall be removed without substantial removal of the base metal.

.2 Groove welds made with the use of backing shall have the weld metal thoroughly fused with the backing.

.3 When tack welds are used for alignment, care shall be exercised by properly grinding or preparing stops and starts to make continuous welding satisfactory.

.4 Flux, pin holes, craters, visual surface defects and excessive crown shall be removed before depositing the next layer of weld.

.5 Stringer beads shall be used for horizontal welds.

312.4.7 Inspection of Welds

312.4.7 .1 Inspection and Testing of Welds

.1 The procedure and technique for visual and non-destructive testing shall be in accordance with CAN/CSA W59, Clauses 7 and 8.

.2 Inspection and Testing Organizations shall demonstrate to the Engineer that the methods they propose to use for non-destructive testing are suitable, and meet one of the following requirements:

  .1 The methods for non-destructive testing shall be as approved by the Province of New Brunswick.

  .2 The Welding Inspection Organization shall be certified to CAN/CSA W178, Qualification Code for Welding Inspection Organizations.

.3 Guided bend tests shall be carried out on coupons in accordance with CAN/CSA W47.1 Section 8.5 and will be tested by the Engineer.

  .1 Guided bend test coupons may be taken from the actual pile splice by removing the coupon from a steel pipe pile splice.

  .2 If the Engineer determines that a guided bend test coupon fails to meet the standard, he may then test sufficient coupons as he feels are necessary to provide assurance that the balance of the welding is satisfactory.

312.4.7.1.3 .3 The preparation of these test coupons shall be done by the Contractor before the pile splice is driven below the ground.

.4 The Contractor shall restore the pile to its original condition, if the weld is acceptable.

312.4.7 .2 Frequency of Inspection and Testing

.1 All welds shall be inspected visually.

.2 Testing shall be carried out by the Engineer as follows:

.1 A minimimum of 25% of full penetration groove welds and steel pipe pile splices shall be tested by non-destructive testing methods (radiographic and/or ultrasonic test methods and supplemented by magnetic particle or liquid penetrant test methods as required) to assure the soundness and quality level of the welds.

.2 A minimum of 25% fillet welds may be tested by non-destructive testing methods (magnetic particle and/or liquid penetrant test methods) to assure the soundness and quality level of the welds.

.3 Welds in steel pipe pile splices may also be tested by guided bend tests on specimens made from a portion of field spliced material removed from the pipe pile.

.1 These specimens shall have the backing removed by mechanical means or by flame cutting to within 3 mm of its thickness followed by grinding or machining.

.2 All guided bend test coupons shall be stamped by the welder.

.3 Non-destructive testing may be performed on coupons in lieu of guided bend tests.

.4 If defects are identified that are outside the criteria specified in 312.4.7.3, the Engineer shall determine the additional percentage of testing that will be carried out to ensure the soundness and quality level of all the welds.

.5 All corrected welds are to be retested.

312.4.7 .3 Quality of Welds

.1 The quality of welds in steel pipe pile splices shall be in accordance with CAN/CSA W59, Section 12, clause 12.5.4.

.2 The acceptance criteria for defects shall be in accordance with CAN/CSA W59 clause 12.5.4 and shall meet the limits described in this clause for tension welds.

.3 The quality of weld required for guided bend tests shall be in accordance with CAN/CSA W47.1, clauses 8.5 and 8.6.

312.4.8 Dynamic Pile Testing

.1 Piles, as identified in the Contract Documents and/or as specifically directed by the Engineer, shall be dynamically tested during driving for measurement and estimation of mobilized resistance, hammer performance, pile stress and soil dynamic properties at the end of initial driving and during all retaps.

.2 The Engineer, based on the results of dynamic testing and analysis, will determine the pile acceptance criteria.

.3 The Contractor shall notify the Engineer at least 7 Days in advance of the pile driving operations.

.4 The Contractor shall assist the Engineer in carrying out the testing.

.5 The testing procedure will be carried out in accordance with AASHTO T298-99.

.6 The Contractor shall provide the Engineer with reasonable means of access to the pile for attaching instruments, with the pile in the leads.

  .1 The Contractor shall provide a work platform, minimum size of 1.2 m by 1.2 m, capable of being raised to the top of the pile.

  .2 The Engineer will require approximately one hour per pile, per test, to attach the instruments.

.7 The Contractor shall supply an electrical power supply of 20 Ampere, 115 Volts, 60 Hz, AC, for use by the Engineer during the tests.

  .1 Field generators shall be equipped with functioning voltage and frequency meters, and shall only supply electrical power for the pile testing.

.8 The Contractor shall provide the Engineer with access for a motor vehicle (van) within 15 m of the pile test or a shelter within the same distance.

  .1 The shelter shall have a minimum floor size of 2.5 m by 2 m, a minimum ceiling height of 2 m, and the interior temperature shall be maintained above 10°C.

.9 With the dynamic testing equipment attached to the pile, the Contractor shall drive to end of initial driving and retap the pile with a hammer of the specified size, as directed by the Engineer.

.10 Stresses in the pile will be monitored during driving to ensure that the stresses do not exceed 90% of the pile steel yield stress.

  .1 If directed by the Engineer, the Contractor shall reduce the driving energy delivered to the pile by means of cushion or helmet modifications, or by reducing the energy output of the hammer.

  .2 If non-axial driving is indicated by the measurements, the Contractor shall immediately realign the driving system.

312.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of piles supplied and installed in accordance with this Item.

.2 All piles shall be measured for payment only after all piles in any group or in close proximity to any other pile have been finalized and no further driving in the pile group will be required.

.3 The length to be measured for payment shall be the difference between the design cut-off elevation and the actual field toe elevation measured along the centerline axis of the pile.

312.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of steel pipe pile, as identified under the Contract.

.2 The Owner will make partial payment in accordance with 908.7 for steel pipe pile stored at the Work Site.

.3 The cost of the provision of materials, labour and Equipment to test the welds shall be borne by the Contractor if the test results show that the material does not meet the specified requirements, otherwise the Owner shall bear the cost of the test.

  .1 The cost of any testing to resolve the quality of welds shall be borne by the Contractor.

.4 Retapping in excess of four operations, if required, shall be paid for in accordance with Item 812.

321.1 DESCRIPTION

.1 This Item consists of the design, supply and construction of all steel sheet pile cofferdam(s) required in the Contract.

321.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 All steel sheet pile shall conform to CAN/CSA G40.20 and G40.21 and, as a minimum, shall be Grade 300W steel.

.3 The Contractor shall supply the sheet pile in lengths such that the toe elevation specified in the Contract Documents is achieved and an undamaged pile is provided up to the specified cofferdam flooding elevation with due consideration given to driving.

.4 The Contractor may use welded steel sheet pile section(s) provided that:

  .1 Welded splices in steel sheet pile shall conforms to the requirements of CAN/CSA W59.

  .2 Welded steel sheet pile splices shall be prequalified full penetration groove welds.

  .3 Upon the request of the Engineer, the Contractor shall test a minimum of 25% of welded steel sheet pile splices by radiographic inspection.

  .4 The acceptance for welded steel sheet pile splices shall be as specified in Clause 12 of CAN/CSA W59 for tension welds in dynamically loaded Structures.

    .1 If unacceptable weld defects are found in welded steel sheet pile splices, the Engineer shall reject the pile section, or

    .2 subject to the approval of the Engineer, the Contractor may undertake to have the weld defects corrected and the splices retested.

.5 The Contractor shall supply the corners for the cofferdam, in lengths as long as the sheet pile supplied.

.6 Materials shall be stored in an organized, straight and horizontal fashion to avoid permanent deformation.

321.3 SUBMITTALS

.1 The Contractor shall be responsible for the design of the cofferdam and associated bracing and shall submit the design, in accordance with Item 956.

  .1 The Contractor shall ensure that the dimensions of the cofferdam shall remain at least as large as that shown in the Contract Documents.

321.3 .2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

321.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall design and construct all cofferdams to be adequately braced to withstand the anticipated design loadings and to be as watertight as practically possible.

.3 Steel sheet piles in cofferdams constructed before or during the winter months of any year shall be pulled or cut off to final elevation before March 1st of the following year, unless otherwise approved in writing.

.4 Work on cofferdams may not start until the June 15th of each year unless otherwise approved in writing.

.5 Steel sheet piles shall be driven to conform with the limits as shown in the Contract Documents and as defined by 321.3.1 and are subject to the tolerances indicated in Table 321-1.

Table 321-1
Cofferdam Sheet Pile Tolerances

Horizontal alignment of walls	± 8 mm per metre of plan length of wall
Vertical Alignment of walls	± 10 mm per metre of vertical length of wall
Misplacement of Eccentricity	± 50 mm parallel to building line, or centreline of Bridge ± 75 mm perpendicular to building line or centreline of Bridge

.6 Cofferdams tilted or moved out of position as per 321.4.5, during driving shall be righted or enlarged to provide necessary clearance and proper location.

.7 Cofferdam walls shall be vented to permit cofferdam flooding at an elevation not higher than the specified cofferdam high water design elevation.

.8 Cross struts or bracing may extend through foundation concrete when indicated on the cofferdam design and having been approved by the Engineer.

.9 Excavation shall not be made outside of cofferdams, and the existing stream bed adjacent to the structure shall not be disturbed, unless specifically permitted in the Contract Documents or in writing by the Engineer.

321.4 .10 Steel sheet piles may remain in place as a part of the permanent structure or they may be removed at the option of the Contractor.

  .1 When the steel sheet piles are to remain in place and form part of the permanent structure, the Contractor shall cut off the steel sheet piles evenly at the elevation indicated in the Contract Documents.

.11 Superimposed loads shall not be placed on the surrounding soil immediately adjacent to cofferdam, unless specifically permitted in the Contract Documents, in writing by the Engineer or having been submitted as part of 321.3.1.

.12 The Contractor shall wait a minimum of 72 hours following the completion of the placing of underwater (tremie) concrete before dewatering the cofferdam unless otherwise altered and approved in writing by the Engineer.

.13 The Contractor shall ensure that adequate dewatering is provided so that all concrete to be placed on top of the tremie concrete is placed in the dry.

.14 The Contractor shall familiarize himself with all permits, Item 948 and any environmental conditions at the site prior to the commencement of the dewatering which may, at the discretion of others, influence his style of operations.

  .1 The Contractor shall be solely responsible for all compliance and undertakings relating to the dewatering discharge and shall maintain records of all pertinent dewatering discharge data required to verify and confirm continuous compliance with the permit parameters though out the period of the Work.

  .2 The Contractor shall submit a Work plan outlining the scope of the proposed monitoring program and this program shall be of a form acceptable to ELG prior to the commencement of the Work.

  .3 A copy of all records shall be submitted to the Engineer on a weekly basis however the submission of this data does not relieve the Contractor of any responsibility with respect to the dewatering discharge.

321.5 MEASUREMENT FOR PAYMENT

.1 The design, supply and construction of all steel sheet pile cofferdam(s) in accordance with this Item shall be on a lump sum basis.

321.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

.2 The Owner will make partial payment for steel sheet pile in accordance with 908.7.

  .1 Partial payment for used steel sheet pile will be calculated on 30% of the estimated purchase price for new steel sheet pile.

.3 The cost of carrying out the radiographic testing under 321.2.4.3 shall be shared equally by the Owner and the Contractor.

.4 In the event that welded steel sheet pile splices are deficient under 321.2.4, all additional testing and repair and retesting of these splices shall be at the Contractor's own expense.

.5 If the Contractor's cofferdam design, submitted under 321.3.1, results in cofferdam dimensions which are larger than the dimensions specified in the Contract Documents, the Contractor shall be responsible, at his own expense, to supply and place the additional concrete, in excess of the specified dimension, to complete the Work.

322.1 DESCRIPTION

.1 This Item consists of the excavation of all materials within cofferdams.

322.2 MATERIALS

.1 None identified.

322.3 SUBMITTALS

.1 None identified.

322.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All material shall be excavated to the full dimension of the cofferdam.

.3 All excavated materials from inside the cofferdam, shall become the property of the Contractor and shall be disposed of outside of the Work Site.

.4 Pre-excavation of the riverbed material shall not be permitted unless specifically noted as a requirement in the Contract Documents.

.5 Disposal areas shall conform to the requirements of Item 947.

.6 Work shall be carried out with specific reference to Item 948.

322.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the volume in cubic metres of material excavated within cofferdams in accordance with this Item.

322.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

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331.5 MEASUREMENT FOR PAYMENT 331-14

331.6 BASIS FOR PAYMENT 331-14

331.1 DESCRIPTION

.1 This Item consists of the supply and installation of the precast prestressed concrete beams.

.2 Prestressing Method - This specification refers to Bulb-Tee's, I-beams, box girders, slabs, hollow core slabs, single and double T-sections and similar Bridge products manufactured by the pretensioning method and in accordance with CAN/CSA S6.

.3 All precast prestressed concrete Bridge elements under this Item shall be referred to as beams.

331.2 MATERIALS

.1 All materials and procedures shall be supplied by the Contractor.

.2 Concrete shall be supplied in accordance with 302.2, except 331.2.2.1 and 331.2.2.11 shall apply, and the concrete shall match the specified concrete requirements of the Structure into which it is being incorporated and/or as specified in the Contract Documents.

.1 The coarse aggregate used in the supply of concrete shall meet the gradation limits indicated in Table 331-1.

Table 331-1
Coarse Aggregate Gradation Limits

ASTM Sieve Size	Percent Passing	
	19 to 12.5 mm	12.5 to 4.75 mm
25 mm	100	
19 mm	85-100	100
12.5 mm	0-15	90-100
9.5 mm	0-5	40-70
4.75 mm		0-15
2.36 mm		0-5

331.2.2 .2 Concrete aggregates shall not expand in excess of 0.035% when tested in accordance with CAN/CSA A23.2-14A concrete prism test with the following modifications to the test procedure;

.1 Testing period shall be 2 years.

.2 Job mix aggregate combination shall contain 430 kg/m^3 cement content.

.3 Water used in production and curing shall be free and clean from any materials which will cause discoloration or harmful effects to the concrete.

.4 Concrete shall have a slump of not greater than 180 mm.

.5 Air entraining admixtures shall be added to the concrete to yield a plastic air content of 6.5% ± 1% by volume.

.6 The water cement ratio shall not exceed 0.40 based on the saturated surface dry condition of the aggregates.

.7 A high range water reducing admixture (superplasticizer) shall be used in the mix design.

.8 The minimum cement content shall be 420 kilograms per cubic metre.

331.2.2 .9 No materials shall be used in the mix design that contain purposefully added chloride compounds in any quantity.

.10 A calcium nitrite corrosion inhibiting admixture shall be added to the concrete at a dosage rate of 15 litres/cubic meter.

  .1 The calcium nitrite corrosion inhibiting admixture shall be manufactured by a firm with a minimum of five years infield experience in the use of corrosion inhibitors for concrete and shall contain between 30% to 36% calcium nitrite by weight of solution.

  .2 The calcium nitrite shall be added at the concrete ready mix plant unless otherwise directed by the Engineer. Verification for the Quantity of the calcium nitrite added, to each batch of concrete, shall be provided to the Engineer.

    .1 Acceptable verification shall include, but is not necessarily limited to, printouts from computerized batch plants or printouts from computerized admixture dispensing units.

.11 When heated concrete is used as a means to accelerate strength development, the maximum plastic concrete temperature shall be 33°C.

.3 Prestressing strands shall be of the 7 wire stress-relieved stabilized type and shall meet the requirements of CAN/CSA G279 and have an ultimate tensile strength of 1860 MPa unless otherwise specified in the Contract Documents.

  .1 Wire welds, breaks, nicks, bends or any other defect shall not be permitted in any prestressing cable.

  .2 All prestressing steel must be free of deleterious materials such as oil, grease, frost, paint, mill scale, loose rust, corrosion or any foreign material, which may prevent bond between steel and concrete.

  .3 In pretensioning strands one approved splice per strand will be permitted, provided the splice is not located within the concrete member. Welded strand joints or wire splices will not be permitted in any reel or coil of strand.

.4 All stranded wire shall be delivered in coils with a metal tag attached to each coil showing:

  .1 the manufacturer's name,

  .2 the heat number,

  .3 the coil number, and

  .4 Each coil shall be accompanied by a stress-strain curve, showing:

    .1 the corresponding information of the metal tag,
    .2 ultimate strength,
    .3 the date of manufacture, and
    .4 the stress-strain curve from zero stress to ultimate.

331.2 .5 The shipping package or form shall be clearly marked with a statement that the package contains high-strength prestressing steel, and the care to be used in handling.

.6 Reinforcing steel shall be supplied in accordance with 304.2.

.7 Inserts shall be of sufficient capacity and of an approved type as specified and shall be placed in the location(s) as indicated by location in the Contract Documents.

.8 Lifting devices shall be supplied in the beam as indicated in Standard Drawing 331-1 and/or as specified in the Contract Documents, and;

- .1 Beams having a mass of less than 12 tonnes shall have a steel plate, as indicated on the Standard Drawing 331-1, typical for the AASHTO type II-Beam.
  - .1 In lieu of the steel plate, a 12.7 mm diameter prestressing cable may be used.
  - .2 This cable shall be formed without kinks into a twisted wire loop with a minimum radius of 50 mm and legs a minimum of 1.2 m in length.
- .2 Beams having a mass of more than 12 tonnes but less than 23 tonnes shall have a steel plate, as indicated on the Standard Drawing 331-1, typical for the AASHTO type III-Beam.
  - .1 In lieu of the steel plate, two 12.7 mm diameter prestressing cables may be used.
  - .2 This cable shall be formed in pairs without kinks into a twisted wire loop with a minimum radius of 50 mm and legs a minimum of 1.2 m in length.
  - .3 Each cable pair shall be tied together immediately after bending to assure identical configuration of the pairs.
- .3 Beams having a mass of more than 23 tonnes and less than 43 tonnes shall have a steel plate, as indicated on the Standard Drawing 331-1, typical for the DOT type I- and AASHTO type IV-Beams.
- .4 Beams having a mass of more than 43 tonnes and less than 60 tonnes shall have a steel plate, as indicated on the Standard Drawing 331-1, typical for the Bulb-Tee type Beams.
- .5 Lifting devices for beams having a mass of more than 60 tonnes must be approved by the Engineer and shall be submitted for approval as part of 331.3.1.
- .6 Beams shall be stored on blocks at least 150 mm off solid level ground and adequately braced and secured to prevent overturning.

331.3 SUBMITTALS

.1 The Contractor shall submit shop drawings for the prestressing system in accordance with Item 956.

331.3 .1 The submission shall show the proposed arrangement, location and details, indicating inserts; manufacture, size, type and ultimate strength of tendons, sequence and rate of tensioning in order to provide prestressing forces and eccentricities as detailed in the Contract Documents.

.2 All prestressing Work shall be carried out by a qualified Contractor or subcontractor, pre-qualified in accordance with Item 907.

.3 The Contractor shall provide the following informational items, for review, a minimum of 21 Days prior to commencing prestressing Work:

  .1 Standard test data certifying that all components of the stressing system conform to minimum specification requirements indicated for these components.

  .2 The manufacturer shall provide quality control procedures for review.

.4 The prestressing system is subject to approval by the Engineer and samples of material such as, but not limited to, pre-stress steel, hold-down/hold-up devices, anchors and couplings shall be submitted for approval, when requested by the Engineer.

  .1 Samples submitted shall be accompanied by all necessary certificates, source of supply, date of manufacture and technical information, to enable the Engineer to carry out a full investigation.

  .2 Sufficient test specimens may be taken from each coil of prestressing steel and tested by the Owner to determine compliance with the requirements of this specification.

    .1 With each prestressing steel sample a certificate shall be submitted stating the manufacturer's minimum guaranteed ultimate tensile strength, the corresponding reel number and the date of manufacture.

.5 The beam manufacturer shall provide the Engineer, in writing, the safety procedures that shall be in force during the period of beam manufacture, prior to the commencement of the manufacture of the beams.

.6 The Contractor at the conclusion of the prestressing shall provide a copy of following records:

  .1 Date of tensioning.

  .2 Beam mark numbers and identification and location in the Structure.

  .3 Identification of jacking Equipment.

  .4 Required total load per strand.

  .5 Initial tension.

  .6 Anticipated and actual gauge pressure for each strand or strand group.

  .7 Anticipated and actual elongation.

  .8 Any problems encountered.

331.3 .7 Submittals are required in accordance with any cross-referenced Item and referred to as forming part of this Item.

331.4 CONSTRUCTION

.1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer and in accordance with CAN/CSA A23.4.

.2 The Contractor shall provide certified copies of quality control tests related to this Contract as specified in CAN/CSA A23.4, CAN/CSA A251 and CAN/CSA G279.

.3 The Contractor shall inspect prestressed concrete tendons in accordance with CAN/CSA G279.

.4 The Contractor shall provide records from in-house quality control programs based upon plant certification requirements to the Engineer for inspection and review.

.5 The Contractor shall, upon request of the Engineer, provide certified copies of the mill test report(s) of the reinforcing steel supplied, showing physical and chemical analyses.

.6 Precast plants shall keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and shall provide this information to the Engineer upon request.

.7 The prestressing plant shall conform to the following minimum requirements:

.1 Only steel side forms and steel or concrete bottom forms shall be used for standard members.

.2 Forms shall be clean, and of a configuration to ensure compliance with the tolerances outlined under this item and the Contract Documents.

.3 Hydraulic jacks and pumps of sufficient capacity shall be used for tensioning cables and only accurately calibrated gauges for registering the stressing forces shall be used.

.4 All chucks used for stressing, depressing or lifting pretensioning cables shall be an approved type of sufficient capacity and in good working order.

.5 Safety devices shall be installed near the stressing bed to provide an adequate safety shield for the protection of workmen during stressing operations.

.6 Cold weather facilities to enable complete fabrication out of the elements shall be provided between October 31ST to May 1ST.

.8 Concrete shall not be placed until all forms, inserts, reinforcing steel and prestressing steel have been checked and approved for compliance with the Contract Documents and any drawings submitted under Item 956.

331.4.1 .9 The concrete placement operation shall be in one continuous operation, without the formation of partially hardened layers of concrete.

- .1 For multiple beam set-ups, the mix design shall be adjusted so that the concrete remains plastic throughout the entire placement.

.10 The Contractor shall provide regular and practically located office space at his prestressing plant to accommodate the Engineer or the Owner's representative.

- .1 The office space so provided shall be ventilated, heated, lighted and clean, and shall be furnished with a suitable standard office desk and chair.
    - .1 The office room temperature shall be maintained at 20°C.
- .2 Convenient telephone, facsimile, photocopy, mail and message handling services shall also be provided.

331.4 .2 Curing of Concrete

.1 When the ambient temperature in the plant does not fall below 5 °C and where the manufacturing facilities are protected from the wind and direct rays from the sun, curing and protection may be performed in accordance with CAN/CSA A23.1 and A23.4 and 302.4.8.

.2 Heat treatment may be used to accelerate strength development by accelerated curing or heated concrete.

- .1 Heated concrete shall have a maximum plastic concrete temperature of 33 °C.

.3 Heat treatment shall be carried out in accordance with CAN/CSA A23.4 and the following:

- .1 Where accelerated curing is used, the beams shall be maintained on the casting bed in an approved enclosure, designed to insure full circulation of thoroughly saturated air and/or steam around the beams with a minimum loss of moisture and heat.
- .2 During the initial curing period (typically 4 to 5 hours after completion of casting) the temperature within the enclosure shall be maintained at approximately 20 °C.
- .3 For the next stage of curing, the temperature within the enclosure shall be raised at a rate not to exceed 15 °C per hour to a minimum of 40 °C and a maximum of 60 °C.
- .4 This temperature shall be maintained until the required strength for the transfer of prestress is reached.

331.4.2 .4 In the case of the application of steam, radiant heat or forced air for accelerated curing;

.1 the accelerated curing shall not begin before the initial set,

.2 the accelerated curing shall provide excess moisture for proper hydration of the cement and

.3 in no instance shall the steam, radiant heat or forced air be directly applied to the concrete, forms or test cylinders.

.5 The exposed surfaces of the concrete shall have an excess of moisture during the entire curing period.

.1 If water is applied for this purpose, then this water temperature shall not vary from the concrete temperature by more than 10 °C nor shall this temperature exceed 60 °C.

.6 After the required strength for transfer of stress has been reached, the temperature shall be lowered at a rate not exceeding 15 °C per hour.

.7 Stress transfer shall take place when the concrete temperature is between 30 °C and 40 °C but all beams must be kept moist until transfer, in accordance with CAN/CSA A23.4, clause 27.6.1.

.8 After transfer of stress the temperature shall be lowered at a maximum rate of 15 °C per hour until the beam is at the ambient air temperature.

.1 The beams shall not be exposed to temperatures below freezing until they have undergone two Days of drying in warm temperatures after the transfer of stress.

.9 The Contractor/manufacturer shall provide a continuous record of curing temperatures for the entire curing period by means of approved accurate automatic recording devices, spaced one per beam to record the temperature throughout the length of the curing enclosure(s).

.1 The maximum permissible temperature variation within the enclosure shall not exceed 5 °C.

.10 Forms shall not be removed until the concrete has obtained the specified release strength.

331.4 .3 Finishing of Concrete Surfaces

.1 The top surface of precast beams shall be rough, clean, and free of laitance with a full amplitude of approximately 6 mm.

.2 Immediately after the stripping of forms, the Engineer shall be informed of all cases where beams require patching.

.1 Proposed patching materials and methods for non-structural repairs shall be submitted for approval of the Engineer.

331.4.3.2 .2 The Engineer shall determine whether patching shall be done before or after the transfer of prestressing force.

.3 Beams with structural defects including cracks and honeycomb are subject to rejection if the load carrying capacity or durability are reduced.

  .1 Repairs of a structural nature shall not be undertaken until the manufacturer's engineer has carried out and obtained the following:

    .1 Investigated the structural implications of the defect or the damage.

    .2 Established the cause of the defect or the damage.

    .3 Received approval of the proposed repair from the Owner.

.3 The permanently exposed surfaces of all beams shall be smooth and free from honeycomb, stain and laitance.

.4 The Contractor shall pressure wash the surface to identify all air voids prior to final finishing.

.5 Small surface voids shall be filled with an approved cement grout mix of cement and fine sand from the same source as used in the concrete and incorporating a latex bonding agent.

  .1 The beams shall remain in a controlled temperature environment for a minimum time period of 48 hours after completion of the repair.

.6 All bearing surfaces must be constructed in such a manner to give a smooth surface, true to lines and grades.

.7 The prestressing steel shall be ground off with an inset at the ends of the beam and the end surfaces of the beam shall then be finished flush in an approved manner.

  .1 Holddown devices in the bottom of the beam shall be finished similarly.

.8 The end surfaces of all beams, except as specifically noted in the Contract Documents, shall be coated with an approved asphalt or bituminous coating.

.9 Concrete repairs shall be carried out and allowed to cure for a minimum time in a controlled temperature environment as recommended by the manufacturer of the repair material and approved by the Engineer.

.10 Concrete surfaces not meeting the approval of the Engineer may be cause for rejection of the beam.

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331.4 .4 Testing and Inspection

.1 Concrete strength at transfer shall be determined by the Contractor in accordance with CAN/CSA A23.1 and as follows:

- .1 In the presence of the Engineer, the Contractor shall cast cylinders and subsequently carry out a minimum of one transfer strength test and one 28-day strength test for each beam containing less than 10 m^3 concrete, and not less than two transfer strength tests and two 28-day strength tests for each beam containing more than 10 m^3 concrete.

- .2 Each transfer strength test shall consist of two cylinders from the same batch and each 28-day strength test shall consist of two cylinders from the same batch and tests shall be conducted in pairs; that is, transfer strength tests and 28-day strength tests shall be from the same portions of the same batches.

- .3 Stress transfer shall not take place until at least one cylinder from each transfer strength test has reached a strength not less than 1 MPa below the specified release strength as indicated in the Contract Documents.

    - .1 stress transfer shall not take place until the average strength of all release test cylinders meets or exceeds the specified release strength.

- .4 The initial curing of the stress release cylinders shall take place in an area representative of the mean temperature of the enclosure.

- .5 The average of all cylinders, of any one beam, tested to determine the 28-day strength shall be equal to or greater than the specified minimum of 28-day strength.

    - .1 Cylinders having a nominal dimension of 100 mm by 200 mm may be used to determine the 28-day compressive strength provided that a correction factor of 0.95 is employed.

    - .2 The allowable strength for each individual cylinder shall not be more than 2 MPa below the specified minimum.

    - .3 The average strength for each test of two cylinders shall not be more than 1 MPa below the specified minimum.

331.4 .5 Reinforcing Steel

.1 The Contractor shall be responsible to position the reinforcing steel within the specified tolerances in accordance with 331.4.8 and 304.4.

.2 All reinforcing steel protruding from the precast member shall be free from oil, grease, any loose or foreign material and excessive concrete.

.3 Supporting chairs for reinforcing steel and prestressing cable shall be heavy plastic tipped and subject to the approval of the Engineer.

331.4 .6 Tensioning and Detensioning

.1 The tensioning and detensioning shall be carried out by the Contractor in accordance with CAN/CSA A23.4 and as follows:

  .1 When stressing is done by jacking the strands from one end of the stressing bed, the prestress force shall be additionally measured on at least two strands at the far end.

    .1 The theoretical jacking force may be increased by a maximum of 5% to attain the required prestress force at the far end of the prestress bed.

      .1 If the required prestress force is still not achieved, the strands shall be jacked from the far end of the bed to give the required prestress.

      .2 If the measured elongation is not within 5% of the theoretical elongation when the specified prestress force is applied, the strand may be temporarily overstressed to overcome friction.

        .1 Such overstressing shall not induce a stress before anchoring exceeding 78% of the specified tensile strength of the strand.

  .2 Anchorage set shall not result in prestress losses exceeding five percent of the theoretical jacking force.

.2 The tensioning procedure and sequence shall be approved by the Engineer and as a minimum shall be in accordance with the following:

  .1 Each strand may be seated by application of an initial tension of 5 kN, and all further tensioning shall be measured by elongation and verified by jack-pressure.

  .2 If the difference between the stressing force measured by the gauges and that determined from elongation exceeds 5%, the source of error shall be found and corrected before continuing with the stressing operation.

.3 Gauges shall be calibrated to read directly in kN or accompanied by a chart from which the dial reading can be converted to kN.

  .1 The hydraulic pressure system activating the gauges shall have appropriate by-pass piping, valves and fittings to enable the gauge pointer to move steadily and without fluctuations.

  .2 Gauging devices shall be calibrated by an approved authority and re-calibrated as requested by the Engineer and, in all cases, at intervals of not more than one year.

.4 Before each prestressing operation, all chucks and jaws shall be inspected, cleaned, lubricated and reassembled.

  .1 Chucks and jaws with hammer marks and/or nicks on their internal working parts shall not be used.

331.4.6 .5 After the concrete in the beam has reached the specified minimum detensioning compressive strength, the strands shall be released in such a manner and sequence that the stresses in the concrete at no time exceed those provided for in the design.

.6 Detensioning is to be performed simultaneously at both ends of the bed and between beam ends and while all beams are warm and moist.

331.4 .7 Identification of Prefabricated Beams

.1 The Contractor shall adopt and show a beam identification system on the beam layout drawing of the shop drawings, whereby identical beams have identical numbers.

.2 During construction, the date of fabrication shall be indicated on each beam.

.3 Identification and fabrication numbers shall be painted on the side of the upper flange of each beam.

.4 Each beam end shall be identified by painting on the approximate compass direction.

331.4 .8 Tolerances

Beam Dimensions	Depth (flange, web and fillets)	± 6 mm
	Depth (overall)	+ 12 mm,- 6 mm
	Depth (flanges plus fillet)	+ 10 mm, - 6 mm
	Width (web)	+ 6 mm, - 3 mm
	Length of Beam	± 1 mm per m but not greater than 20 mm
Exposed Beam Ends Deviation (from square or designated skew)	Horizontal	+ 6 mm
	Vertical	± 10 mm per m of beam height
Side Inserts	spacing between centers of insert and from centers of inserts to the end of the beam	± 12 mm
Skew Angle Variation		± 3°
Bearing Plates	spacing between the centers of bearing plates to the ends of the beams	± 6 mm
Bearing Plates	spacing between the centers of bearing plates	± 1 mm per m of spacing but not greater than 20 mm
Bearing Plate or Bearing Area	deviation from plane	± 2 mm
Stirrup Bars	projection above theoretical top of the beam	± 20 mm

continued...

335.2.6.1.1 .3 System "C": Bare steel – uncoated except for 3 metres from the end of the Structure, at the abutments, and 3 metres on each side of continuous expansion joints, which will be coated by "System "A" with colour to match weathering steel.

.2 The primer and top coat must be compatible with each other and must be manufactured by the same company.

.3 The colour of the top coat is to be a colour to match the weathering steel for system A and leafed aluminum for system B.

.1 A sample of the proposed paint colour shall be submitted to the Engineer for approval prior to any application in the Work.

.4 The paint system consisting of the inorganic zinc primer and the top coats of paint shall be approved the Engineer.

.5 The coatings indicated in Table 335-1 are approved by the Engineer for use in the Work.

Table 335-1
Approved Coating(s) for System C

Supplier	Material	Product
Tnemec Company Inc. (416) 677- 1280	Inorganic Zinc Primer	N90E92 Tneme-Zinc
	High build Acrylic Polyurethane Enamel	Colour - Series 73 Endura-shield 3 CGSB 503-203
Corrosive Services Ltd. (416) 630 - 2600	Inorganic Zinc Primer	Carbo Zinc II
	Aliphatic Polyurethane High build Satin finish	Colour - Carboline 133HB CGSB 503-203

335.2.6.1 .6 The paint system consisting of the inorganic zinc primer and the top coats of paint other than those indicated in Table 335-1 and/or in the Contract Documents shall be approved by the Engineer, and

.1 the Contractor must demonstrate to the Engineer's satisfaction that the proposed paint system meets the requirements of either System A or System B, and

.2 the Contractor must provide the Engineer with proven case histories of Bridges or similar Structures, with similar exposure conditions, where the proposed system has been previously employed.

.7 The Owner may decide not to entertain substitution during the period of the Contract.

331.4 .8 Tolerances (cont'd)

Horizontal Alignment	deviation from a straight line parallel to the center line of beam	1 mm per m of span
Camber	differential between adjacent beams	1 mm per m of span to maximum of 25 mm
Center of Gravity of Strand Group and Individual Tendons		± 6 mm
Position of Deflection Points for Deflected Strands	Deflection points are to be concentric with respect to the middle of the beam	± 100 mm
Position of Lifting Device		± 150 mm
Position of Temporary Bracing Insert	longitudinal	± 25 mm

331.4 .9 Handling, Storage and Shipping

.1 Beams shall not be shipped until the concrete in the beams has reached the specified 28-day strength.

.2 The beams shall be handled and stored so that the points of support will be the same as when the beams are in their final position, except that for transporting they may be supported at a distance equal to the depth of the beam measured along its centerline from the end of the beam or as indicated on the shop drawings.

.3 If the finished beam is to be stored on concrete supports then a softer material such as wood or rubber shall be used between the beam and the support.

.4 Beams damaged by improper handling, storage, transportation or erection are subject to rejection if their load carrying capacity has been reduced.

.5 Beams shall be erected by two cranes.

.6 The use of slings which result in a horizontal force component into the beam is prohibited.

.7 Where beams are proposed to be erected by a single crane, the Contractor shall submit the detailed Work plan and shall obtain written approval prior to conducting the Work.

.8 Should the bearing surfaces of the prestressed beams or finishing of the concrete bearing blocks leave a gap between the surface of the bearing pad and bottom of the beam, the Contractor shall grind to fit.

335.2.6 .2 Ethyl Silicate Zinc Rich Primer

335.2.6.2 .1 General

.1 The inorganic zinc silicate paint shall be a two-component self-curing type which, when mixed and applied in accordance with the manufacturer's instructions, cures without the use of a separate curing solution, and shall have the properties described herein.

.2 The inorganic zinc silicate paint shall meet or exceed the requirements of Steel Structures Painting Council Specification PS 12.00 as well as CGSB 1-GP-171C.

.3 The inorganic zinc silicate paint shall also meet or exceed the requirements for use on contact surfaces of structural joints using ASTM A-325 or A-490 bolts.

335.2.6.2 .2 Composition

335.2.6.2.2 .1 Pigment

.1 The zinc portion of the pigment shall be a finely divided zinc powder containing, by weight, a minimum of 94% metallic zinc and a minimum of 98% total zinc.

.2 The zinc powder shall have a specific gravity of 7.00 to 7.15, as determined using the procedure set forth in ASTM D135.

.3 All other fillers contained in the pigment shall be inert substances with an average particle size of 6 microns.

335.2.6.2.2 .2 Vehicle

.1 The vehicle components shall consist primarily of a partially hydrolyzed ethyl silicate, in an appropriate alcohol solvent.

335.2.6.2.2 .3 Vehicle Composition and Properties

.1 Non-volatile content shall be 35 - 39 percent by weight of the vehicle (without pigment), when tested in accordance to ASTM D1644, Method A (105 °C for 3 hours),

.2 The weight per litre shall be 1.04 -1.09 kg/l at 25 °C.

.3 The storage life of the vehicle shall be 9 months minimum at 25 °C.

331.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of beams supplied and installed in accordance with this Item.

331.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of precast prestressed concrete beam, as identified under the Contract.

.2 The Owner will make partial payment for beams in accordance with 908.7.

332.1 DESCRIPTION

.1 This Item consists of the supply and installation of the complete post-tensioning system.

332.2 MATERIALS

.1 All materials and procedures shall be supplied by the Contractor.

.2 Concrete shall be supplied in accordance with Item 302.2 and shall match the specified concrete requirements of the Structure into which it is being incorporated and/or as specified in the Contract Documents.

.3 Grout shall be a pre-packaged natural aggregate grout, mixed, placed and cured as recommended by the manufacturer.

  .1 Grout shall conform to ASTM C1107 Grade B or Grade C when tested at a fluid consistency of 25 - 30 seconds as per ASTM C939, at temperature extremes of 5 °C and 25 °C, and an extended working time of 30 minutes.

  .2 Grout shall not contain chlorides or other chemicals known to be deleterious to the post-tensioning steel.

    .1 Chlorides shall be determined in accordance with CSA A23.2-4B.

    .2 When testing for nitrates the sampling procedure shall be in accordance with CSA A23.2-4B, Clauses 5, 6.1, 6.2 and 6.3, then the nitrates in water, so extracted, shall be determined in accordance with ASTM D4327.

.4 Grout shall also be supplied in accordance with CSA A23.1 and shall be proportioned to provide the specified properties as indicated in the Contract Documents and as a minimum shall have the following properties:

  .1 An approved expanding agent additive or approved pre-manufactured non-shrink grout formulation,

  .2 a water cement ratio between 0.40 and 0.45, and

  .3 a minimum compressive strength of 20 MPa at 1 Day, 40 MPa at 7 Days and 60 MPa when tested at 28 Days in accordance with CSA A23.2 when cured at 23 °C and shall also meet the 7- and 28-day requirements when tested and cured at the 5 °C and 25 °C limits.

.5 Reinforcing steel shall be supplied in accordance with Item 304.2.

.6 Post-tensioning strands shall be of the 7-wire stress-relieved type and shall meet the requirements of ASTM A416 and have an ultimate tensile strength of 1860 MPa, unless otherwise specified in the Contract Documents.

332.2 .7 Post-tensioning wire shall be a high tensile strength wire specifically manufactured for use in prestressed concrete and shall meet the requirements ASTM A421 and shall be of a type BA where cold-end deformation is used for anchoring purposes, or type WA where ends are anchored by wedges.

.8 Post-tensioning tendons shall also be supplied in accordance with CAN/CSA G279 and CAN/CSA S6.

.9 Anchorages and couplings shall be supplied in accordance with CSA A23.1.

.10 The Contractor shall supply bright or galvanized sheet steel sheaths fabricated and placed to be grout tight.

332.3 SUBMITTALS

.1 The Contractor shall be responsible for the design of the post-tensioning system and shall submit the design, in accordance with Item 956.

.2 All post-tensioning Work shall be carried out by a qualified Contractor, or subcontractor pre-qualified in accordance with Item 907, and

  .1 The Contractor shall provide the Engineer with the name of the proposed post-tensioning firm.

  .2 The post-tensioning firm shall show to the Engineer's satisfaction that he has the Equipment, materials and suitably trained and experienced staff to supply and supervise the installation of the required post-tensioning system.

.3 The Contractor shall provide the following informational items, for review, a minimum of 40 Days prior to commencing post-tensioning Work:

  .1 a load-strain curve certifying physical properties for each mill heat of bar steel and/or wire steel,

  .2 the physical properties and chemical composition for bar steel and/or wire steel verifying that the materials conform to the minimum specification requirements indicated,

  .3 a mill certificate for anchorages and X-rays of each multi-strand single wire anchorage,

  .4 hardness test result(s) for heat treated anchorages,

  .5 any other standard test data required to certify that all components of system conforms to minimum specification requirements indicated for these components, and

    .1 the manufacturer shall provide quality control procedures for review.

.4 The submission shall also show the proposed arrangement, location and details, indicating wobble coefficients and belt friction, for sheathing and couplings; manufacture, size, type and ultimate strength of tendons, sequence and rate of tensioning in order to provide post-tensioning forces and eccentricities as detailed in the Contract Documents.

332.3 .5 The post-tensioning system is subject to approval by the Engineer and samples of material such as post-tensioning steel, anchors, couplings, sheath and grout components shall be submitted for approval, when requested by the Engineer.

- .1 Samples submitted shall be accompanied by all necessary certificates, source of supply, date of manufacture and technical information, to enable the Engineer to carry out a full investigation.

- .2 Sufficient test specimens may be taken from each coil of post-tensioning steel and tested by the Owner to determine compliance with the requirements of this specification.

  - .1 With each sample of post-tensioning cable for testing, there shall be submitted a certificate stating the manufacturer's minimum guaranteed ultimate tensile strength, the corresponding reel number and the date of manufacture.

.6 All stranded wire shall be delivered in coils with a metal tag attached to each coil showing, the manufacturer's name, the heat number and the coil number.

.7 Each coil shall be accompanied by a stress-strain curve, showing, the corresponding information of the metal tag, the ultimate strength, the date of manufacture and the stress-strain curve from zero stress to ultimate.

.8 The shipping package or form shall be clearly marked with a statement that the package contains high-strength post-tensioning cable; the type of care to be used in handling; and the type, kind and amount of corrosion inhibitor used, including the date when placed, safety orders and instructions for use.

.9 The Contractor at the conclusion of the post-tensioning shall provide a copy of following records:

- .1 Date of tensioning;
- .2 Identification and number of elements;
- .3 Identification of jacking Equipment;
- .4 Required total load per strand;
- .5 Initial tension;
- .6 Anticipated and actual gauge pressure for each strand or strand group;
- .7 Anticipated and actual elongation;
- .8 Any problems encountered;

.10 Submittals are required in accordance with any cross referenced Item forming part of this Item.

332.4 CONSTRUCTION

332.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All concrete Work shall be carried out in accordance with Item 302.

332.4 .2 Post-tensioning Steel

.1 All post-tensioning steel must be free of deleterious materials such as oil, grease, frost, paint, mill scale, loose rust, corrosion or any foreign material which may prevent bonding between steel and concrete.

.2 The use of post-tensioning steel having kinks, bends, nicks or other defects is not permitted.

.3 During all stages of transport, handling, storage and construction, all post-tensioning materials shall be thoroughly protected against corrosion, crushing or other damage.

.4 All water used for flushing ducts shall contain either quick lime (calcium oxide) or slaked lime (calcium hydroxide) in the amount of 10 kg/m^3.

  .1 All compressed air used to blow out ducts shall be oil free.

.5 When wires are to be button-headed, the buttons shall be cold formed symmetrically about the axis of the wire.

  .1 The buttons shall develop the minimum guaranteed ultimate tensile strength of the wire.

  .2 No cold forming process shall be used that causes indentations in the wire.

.6 Post-tensioning steel which is installed in members prior to placing and curing of the concrete shall be continuously protected against rust or other corrosion, by means of a corrosion inhibitor placed in the ducts or applied to the steel in the duct, until grouted.

.7 When post-tensioning steel is installed in the ducts after completion of concrete curing, and if stressing and grouting are completed within 10 Days after the installation of the post-tensioning steel, rust which may form will not be cause for rejection of the steel.

  .1 Post-tensioning steel installed, tensioned and grouted within 10 Days, will not require the use of a corrosion inhibitor in the duct following installation of the post-tensioning steel.

    .1 Post-tensioning steel installed but not grouted within 10 Days shall be subject to all the requirements pertaining to corrosion protection and rust.

332.4.2 .8 In tensioning strands, one approved splice per strand will be permitted provided the splice is not located within the concrete member.

.1 Welded strand joints or wire splices will not be permitted in any reel or coil of strand.

332.4 .3 Placement of Cables

.1 Post-tensioning cables shall be placed within a tolerance of ± 5 mm of their theoretical position and all kinks and undulations shall be avoided.

.2 Cables shall be supported on rigid metal supports not exceeding a spacing of 1 m and attached to the vertical stirrups without welding.

.3 The Contractor shall repair the sheath to the satisfaction of the Engineer should the sheath become punctured or crushed at any time during the placement of cables and prior to or during the placement of concrete.

.4 Where the end of a post-tensioned assembly will not be covered by concrete, the anchoring devices shall be recessed so that the ends of the post-tensioning steel and all parts of the anchoring devices will be at least 50 mm inside of the end surface of the members, unless otherwise indicated in the Contract Documents.

.1 Following post-tensioning, the recesses shall be filled with an approved type of dry pack material and finished flush.

332.4 .4 Anchorages and Couplings

.1 All post-tensioning steel shall be secured at the ends by means of an approved permanent type anchoring device.

.2 Anchorages shall be capable of transferring the maximum post-tensioning force to the concrete without distress to the concrete.

.3 The final unit compressive stress on the concrete directly underneath the anchorage assembly shall not exceed 21 MPa.

.4 Bending stresses in the plates or assemblies induced by the pull of the post-tensioning steel shall not exceed the yield point of the material nor cause visible distortion in the anchorage plate when 100% of the ultimate load is applied.

.5 Anchorages shall be provided with suitable ports for the injection of grout.

332.4 .5 Sheath

.1 The sheath shall be provided with air vents at all high points in the cables.

332.4 .6 Tensioning Equipment

.1 Hydraulic jacks and pumps of sufficient capacity shall be used for tensioning of cables.

.2 All gauges or load cells used for registering the stressing forces shall be calibrated and certified within the previous 12 months of the time of the Work.

  .1 If a pressure gauge, is used it shall have an accurate reading dial at least 150 mm in diameter and each jack and its corresponding gauge shall be calibrated as a unit and shall be accompanied in the field by a certified calibration chart.

  .2 If a load cell is used it shall be calibrated and shall have an indicator by means of which the post-tensioning force in the cables may be determined.

332.4 .7 Cold Weather Requirements

.1 Cold weather requirements for grout shall be the same as for concrete as outlined in 302.4.

.2 The temperature of the concrete surrounding the sheath shall not be less than 5 °C during grouting and the temperature of the surrounding concrete shall be maintained at a minimum of 5 °C for not less than 7 Days after grouting.

332.4 .8 Supervision

.1 The Contractor shall retain personnel on site with extensive experience in post-tensioned/prestressed concrete construction and who is thoroughly familiar with the post-tensioning system being used, and this person(s) shall be present at all times during cable placing, stressing and grouting.

332.4 .9 Post-Tensioning

.1 No stressing by post-tensioning shall be undertaken until all concrete in the Structure has reached a strength as specified in the Contract Documents.

.2 Prior to post-tensioning any member, the Contractor shall demonstrate that the post-tensioning steel is free and unbonded in the duct.

.3 Stress in the cables shall be measured with a dynamometer accurate to ± 0.5% and verified by elongation based on the stress-strain characteristics of the wire.

332.4 .10 Grout

.1 All cable ducts shall be filled with grout in one continuous operation after the completion of stressing.

.2 During freezing weather, the grout shall be kept at a minimum of 5 °C for not less than 7 Days.

332.4.10 .3 The grouting Equipment shall be capable of grouting at a minimum pressure of 0.7 MPa and the grouting Equipment shall be furnished with a pressure gauge having a full-scale reading of not more than 2 MPa.

.4 Standby flushing Equipment capable of developing a pumping pressure of 1.7 MPa and of sufficient capacity to flush out any partially grouted cable ducts shall be provided.

.5 All grout shall pass through a screen with 1.8 mm maximum clear opening size prior to being introduced into the grout pump.

.6 If a breakdown of the grout pump occurs during the grouting operation, the cable duct shall be flushed out and the entire cable duct regrouted.

332.5 MEASUREMENT FOR PAYMENT

.1 The supply and installation of the complete post-tensioning system in accordance with this Item shall be on a lump sum basis.

332.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

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335.1 DESCRIPTION

.1 This Item consists of the supply including but not limited to, the fabrication, surface preparation, shop and field painting, delivery and erection of steel Superstructure to the Work Site.

.2 The Bridge Superstructure has been designed according to CAN/CSA-S6-00, with a CL625-ONT live loading and all Work shall Conform to this, except as noted in the Contracts Documents.

335.2 MATERIALS

335.2 .1 General

.1 All materials shall be supplied by the Contractor.

.2 The supply of any additional structural steel not shown on the Contract Documents, deemed necessary for the erection condition, including falsework and guys that may be required to maintain stability, shall be at the Contractor's own expense.

335.2 .2 Structural Steel

.1 All structural steel with the exception of secondary members comprised of rolled shapes shall meet the requirements of CAN/CSA G40.21 Grade 350 AT - Category 3, "Atmospheric Corrosion Resistant Structural Steel" with "Improved Low Temperature Properties".

  .1 This material shall possess a minimum Charpy V Notch impact energy of 27 Joules when tested at minus 30 °C.

.2 All tee sections, channels, rolled beam and angle shapes and pintles shall Conform to CAN/CSA G40.21 M Grade 350A.

.3 Sample preparation and testing shall be in accordance with the requirements of CAN/CSA G40.20.

.4 All steel shall be delivered in accordance with CAN/CSA G 40.20.

.5 Structural shapes and angles shall be individually colour marked in accordance with CAN/CSA G40.21 or CAN/CSA G40.20, when shapes under 150 mm in cross sectional dimension are shipped in bundles and tagged in bundles.

.6 All anchor and anchor bolt assemblies including fabricated sections, nuts and washers shall Conform to CAN/CSA G40.21 Grade 350A.

335.2 .3 High Tensile Bolts

.1 High tensile bolts, nuts and washers shall Conform to ASTM A325 and shall be galvanized Type I for painted steel or Type 3 for unpainted corrosion-resistant steel.

.2 Nuts and bolts shall be shipped together as an assembly.

335.2 .4 Welding Electrodes

.1 Electrodes shall Conform to CAN/CSA W48.1, W48.3, W48.5 and W48.6.

.2 Filler metal shall be in accordance with Table 5-1, "Filler Metal Requirements for Exposed Bare Applications of CAN/CSA G40.21 350 A, 350 AT, 400 A, 400 AT and ASTM A242 and A588 Steels" of CAN/CSA W59.

.3 Deposited weld metal shall have a minimum Charpy Impact Energy of 27 Joules at minus 30°C in accordance with Appendix A of CAN/CSA S6.

   .1 The Contractor shall provide certification of groove welds.

.4 The selection, supply and storage of electrodes and fluxes shall be in accordance with Clause 5 of CAN/CSA W59-M.

   .1 Only controlled hydrogen (CH) designation electrodes shall be used for the flux-cored welding process.

.5 Weld material used with corrosion resistant steels in unpainted applications shall have similar corrosion resistance and colour as the base metal, as required by CAN/CSA W59.

335.2 .5 Stud Shear Connectors

.1 Stud shear connectors shall be of a headed stud type, in accordance with the requirements of CAN/CSA W59.

335.2 .6 Coatings

.1 General

   .1 The coating to be applied to the structural steel shall consist of an inorganic zinc primer and two top coats of paint in accordance with one of the following coating systems:

      .1 System "A": Inorganic zinc primer *plus* high build modified aluminum epoxy mastic paint *plus* high build aliphatic polyurethane paint.

      .2 System "B": Inorganic zinc primer *plus* high build modified aluminum epoxy mastic paint.

335.2.6.2 .3 Mixed Paint

335.2.6.2.3 .1 General

.1 The total zinc portion shall be at least 85 percent by dry weight of the total solids of the dried coating.

.2 The total solids shall not be less than 79 % by weight, when tested in accordance with ASTM D1644, method A (105 °C for 3 hours).

.3 The paint shall tolerate up to 1% water contamination by weight without gelation, within 5 minutes.

.4 The useable pot life of the mixed paint shall be not less than 4 hours at 25 °C.

  .1 There shall be no hard settling which cannot be easily re-dispersed during this period.

.5 When applied by spray to prepared panels at a dry film thickness of 125 μm ± 12 μm, the film shall exhibit good adhesion and when observed with the unaided eye shall be free from cracks.

.6 The mixing ratio in one litre shall be 0.80 kg of base component to 1.75 kg of zinc component.

.7 The weight per litre shall be 2.46 to 2.7 kg/l at 25 °C.

335.2.6.2.3 .2 Colour

.1 The inorganic zinc coating shall be formulated so as to produce a distinct contrast in colour with the blast cleaned metal surfaces.

335.2.6.2.3 .3 Resistance

.1 Test panels of steel meeting the requirements of ASTM D 609, having dimensions of 50 x 125 x 3 mm, shall be prepared by cleaning all surfaces as specified by SSPC-SP 10, "Near White Metal Blast" to a 25 - 75 μm profile.

  .1 A 75 μm coating (dry thickness) shall be applied to the test plates in accordance with the manufacturer's printed application instructions.

.2 The coating shall be cured as recommended by the manufacturer.

.3 Each of the following tests shall be performed:

335.2.6.2.3.3.3 .1 Cleaning

.1 Surfaces to be painted with inorganic zinc shall be blast cleaned with abrasives producing a nominal height profile of 25 - 75 μm.

.2 All oil, grease, dirt, rust scale and other foreign matter shall be completely removed except as herein after modified.

.3 All rust, mill scale and old paint shall be removed.

.4 At least 95% of each square 25 mm shall be free of all visible residues and the remainder shall be limited to light discoloration (SSPC SP10).

.5 Surfaces shall be cleaned to a condition at least equal to the appearance of the pictorial surface preparation standard, labelled SA 2-½ in ASTM D2200, that applies to the starting rust grade of the steel.

.6 Surfaces shall be cleaned to meet the requirements of SSPC SP10.

335.2.6.2.3.3.3 .2 Fresh Water Resistance

.1 Panels shall be scribed down to base metal with an "X" of at least 50 mm legs and shall be immersed in fresh tap water at 24 °C ± 3 °C.

.2 The panels shall show no rusting, blistering or softening when examined after 30 Days.

335.2.6.2.3.3.3 .3 Salt Water Resistance

.1 Panels shall be scribed down to the base metal with an "X" of at least 50 mm legs and immersed in 5 % sodium chloride at 24 °C ± 3 °C.

.2 The panels shall show no rusting, blistering or softening upon examination after 7, 14 and 30 Days.

.3 The sodium chloride solution shall be replenished with fresh solution after each examination.

335.2.6.2.3.3.3 .4 Weathering Resistance

.1 Panels shall be tested in accordance with ASTM G 23, Type D.

.2 The panels shall be placed on test at the beginning of the wet cycle.

.3 After 1,000 hours of continuous exposure, the coating shall show no rusting, loss of adhesion to the steel test panel or blistering.

335.2.6.2.3.3.3 .5 Salt Fog Resistance

.1 Panels shall be scribed down to the base metal with an "X" of at least 50 mm legs down to bare metal.

.2 The test panels shall then be tested in accordance with ASTM B 117.

.3 After 1,000 hours of continuous exposure, the coating shall show no loss of bond, nor shall it show rusting or blistering beyond 1.5 mm from the centre of the scribe mark.

335.2.6.2.3.3.3 .6 Resistance to Elevated Temperatures and Thermal Shock

.1 Panels shall be exposed to a temperature of 260 °C for one hour, then quenched immediately in 18.3 °C ± 3 °C water.

.2 Panels subjected to this test shall show no blistering or flaking of the coating.

335.2.6.2.3.3 .4 If any individual test panel fails any of the tests, noted in 335.2.6.2.3.3, the material shall not be accepted.

335.2.6.2.3 .4 Packaging and Labelling

.1 Inorganic zinc paint shall be packaged in two separate containers.

.2 The components shall be packaged in such proportions that the pigment mixed with the vehicle, shall yield 22.7 litres of mixed paint.

.3 Each container shall bear a label on which shall be clearly shown the name of the manufacturer or brand name of paint, the lot number, and date of manufacture.

.1 The container shall be coated if necessary to prevent attack by the paint components.

335.2.6.2.3 .5 Application

.1 The manufacturer's current printed instructions of application of inorganic zinc coating shall be submitted for review.

335.2.6.2.3 .6 Manufacturer and Brand Name Approval

.1 Prior to approval and use of any inorganic zinc, the manufacturer shall submit to the Owner certified test reports from an approved independent testing laboratory showing specific test results Conforming to all quantitative requirements and resistance test requirements of the Contract Documents.

335.2.6.2.3.6.1 .1 In addition, the certified test report shall contain the exact ratio by weight, of the pigment component to the vehicle component of the paint used for the tests, the lot tested, the manufacturer's name, brand name of paint, and date of manufacture.

.2 To obtain final acceptance of the inorganic zinc, the manufacturer shall furnish a certification stating that the material is formulated the same as the material tested for manufacturer and brand name approval.

.3 The Owner reserves the right to sample and test any or all materials supplied.

335.2.6 .3 High Build Modified Aluminum Epoxy Mastic Finish Coating

335.2.6.3 .1 General

.1 The coating shall be a self-priming, two-component, high build, aluminum filled epoxy mastic.

.2 The coating shall be compatible with inorganic zinc primers, catalyzed epoxies, catalyzed phenols or other overcoats, as recommended by the coating manufacturer.

.1 The coating shall also be compatible to be used over most generic types of coatings which are tightly adhering and properly prepared.

.3 The coating shall cure to a hard, tough finish when applied at thickness' of 125 - 175 μm dry film thickness (DFT) over properly prepared surfaces of existing coatings as recommended by the coating manufacturer.

335.2.6.3 .2 Composition

335.2.6.3.2 .1 General

.1 Solids by volume of the coating, when mixed, shall be 90 ± 2% when tested in accordance with ASTM D 269, modified to a dry time of 24 hours at 24 °C.

.2 Solids by weight of the coating, when mixed, shall be 94 ± 4% when tested in accordance with ASTM D 1644, modified to a dry time of 72 hours at 38 °C rather than 3 hours at 105 °C.

335.2.6.3.2 .2 Pigment

.1 The primary pigment shall be a leafing aluminum flako and shall represent 17 - 19% of the total pigment by weight.

.2 The percent pigment shall be 19% minimum, by volume of the coating, when mixed.

.3 The percent pigment shall be 38% minimum, by weight of the coating, when mixed.

335.2.6.3.2 .3 Vehicle

.1 The percent vehicle shall be 66% minimum, by volume of the coating, when mixed.

.2 The percent pigment shall be 52% minimum, by weight of the coating, when mixed.

.3 The percent non-volatile vehicle shall be 74% minimum, by volume of the coating, when mixed.

.4 The nominal VOC (Volatile Organic Content) of the coating, as supplied, shall be 89 grams per litre.

335.2.6.3.2 .4 Vehicle Composition and Properties

.1 The density of Part A shall be 1140 - 1260 grams per litre; the density of Part B shall be 1300 - 1620 grams per litre; the density of the mixed coating shall be 1320 - 1440 grams per litre, when measured in accordance with ASTM D 1475 at 24 ± 10 °C.

.2 The viscosity of Part A shall be 20,000 - 30,000 cps, at the time of manufacture, when tested at 24 °C with a #7 spindle at 20 rpm.

.3 The viscosity of Part B shall be 12,000 - 19,000 cps, at time of manufacture, when tested with #6 spindle at 50 rpm Brookfield Viscometer.

.4 The flash point of the Part A shall be >93 °C and the flash point of the Part B shall be 24.5 °C when measured with a Pensky-Martens Closed Cup Tester in accordance with ASTM D 93.

335.2.6.3 .3 Mixed Paint

335.2.6.3.3 .1 General

.1 The mixed coating, when applied at 125 μm dry film thickness, may be topcoated with most generic types of coatings after curing a minimum of 24 hours at 24 °C.

  .1 Final cure shall be attained after 5 Days minimum at 24 °C.

.2 The coating when mixed, unthinned shall build a minimum wet thickness of 300 μm when applied with a Leneta Anti-sag Meter or equal at 24 °C.

.3 The adhesion of one coat, 112.5 - 125 μm, cured for 30 Days at room temperature and applied over steel prepared per SSPC SP10 shall average at least 4800 kPa, over four readings, when tested by elcometer in accordance with ASTM D 4541.

.4 The coating shall have a mix ratio of 1:1 by volume.

.5 The pot life of the mixed coating shall be a minimum of 4 hours when the material and ambient temperature are 24 °C and the material has been thinned according to manufacturer's recommendations.

.6 The coating shall be capable of being applied when the material is at a temperature as low as 10 °C.

.7 The coating shall be capable of being applied when the surface temperature is as low as 10 °C.

.8 The coating shall be capable of being applied when the ambient temperature is between 10 °C and 38 °C.

.9 The mixed paint shall have a mass of 1080 g ± 50 g per litre when measured at 25 °C ± 1 °C.

335.2.6.3.3 .2 Properties of Mixed Paint

.1 The finish coating system shall consist of a high build modified aluminum epoxy mastic.

.2 The epoxy mastic shall display compatibility over properly prepared inorganic zinc primers.

.3 The epoxy mastic shall be leafed aluminum in colour.

.4 The high build modified aluminum epoxy mastic shall be supplied as a two package material with a one to one volume mix ratio, and shall be well ground and not caked, skinned or badly settled in the container.

335.2.6.3.3.2 .5 Film Build

.1 In order to test film build, the catalyzed mixture, thinned 10 percent by volume with the specified thinner, shall be spray applied at a 250 µm wet film thickness without exhibiting runs or sags and shall yield 200 µm dry film thickness in one coat.

.2 The average dry film thickness of the product, applied in one coat, shall be no less than 125 µm.

  .1 This thickness shall be checked by the Contractor in the presence of and to the satisfaction of the Engineer.

.3 The epoxy mastic shall not be applied when the surface temperature is below 24 °C and shall not be applied when the temperature is expected to drop below 4 °C, before the coating has cured.

.4 The epoxy mastic shall air cure at a temperature of 24 °C or above to a hard tough film within 5 Days, by evaporation of solvent and chemical reaction.

  .1 It shall be dry to the touch in 24 hours at 24 °C or 2 hours at 32 °C.

335.2.6.3.3.2 .6 Flexibility

.1 In order to test flexibility, the Contractor shall apply 125 µm DFT of the epoxy mastic on a sandblasted steel panel and cure the coating for 2 weeks at 24 °C.

  .1 The panel shall be sandblasted in accordance with SSPC SP5.

  .2 The panel shall be 100 x 750 x 3 mm.

  .3 The coating shall show no signs of cracking or loss of adhesion after the panel is informally bent around on an 200 mm diameter mandrel.

335.2.6.3.3 .3 Resistance

.1 The steel test panels, meeting the requirements of ASTM D609, having dimensions of 50 x 125 x 3 mm shall be prepared by sandblasting to a white metal surface, in accordance with SSPC SP5.

  .1 The steel test panels shall then be exposed to the weather for 30 Days so that a uniform rusting occurs.

  .2 The steel test panels shall then be hand cleaned with a wire brush in accordance with SSPC SP2.

335.2.6.3.3.3 .2 The epoxy mastic shall be spray applied to the steel panels at 150 μm dry film thickness in one coat.

- .1 The coating shall be cured as recommended by the manufacturer.

.3 Each of the following tests shall be performed:

335.2.6.3.3.3.3 .1 Fresh Water Resistance

- .1 The coated panels shall be scribed down to base metal with an "X" of at least 50 mm legs and shall be immersed in fresh tap water at 24 °C ± 3°C.
- .2 Upon examination after 30 Days immersion, the panels shall be unaffected except for discoloration of the epoxy mastic coating.
- .3 There shall be no blistering, softening, or visible rusting of the coating beyond 1.5 mm from the center of the scribe mark.

335.2.6.3.3.3.3 .2 Salt Water Resistance

- .1 Panels shall be scribed down to the base metal with an "X" of at least 50 mm legs and immersed in 5 % sodium chloride solution at 24 °C ± 3°C.
- .2 The panels shall be unaffected except for discoloration of the epoxy mastic coating, upon inspection after 7, 14 and 30 Days.
- .3 There shall be no blistering, softening, or visible rusting of the coating beyond 1.5 mm from the center of the scribe mark.
- .4 The sodium chloride solution shall be replenished with fresh solution after each examination.

335.2.6.3.3.3.3 .3 Weathering Resistance

- .1 The panels shall be tested in accordance with the following tests;
  - .1 ASTM G26, Method A, Type BH for 300 hours, followed by Salt Fog Resistance, ASTM B 117 for 1,000 hours, shall exhibit no creep from scribe, no blistering, red rust or softening.
  - .2 ASTM G23, Type D for 300 hours, followed by Salt Fog Resistance, ASTM B 117 for 1,000 hours, shall exhibit no creep from scribe, no blistering, red rust or softening.
  - .3 ASTM G26, Method A Type BH for 3,000 hours shall only exhibit trace chalking, no blistering, red rust, or softening.
- .2 The panels shall be placed on test at the beginning of the wet cycle.

335.2.6.3.3.3.3 .4 Salt Fog Resistance

.1 Panels shall be scribed with an "X" of at least 50 mm legs down to base metal.

.2 The test panels shall then be tested in accordance with ASTM B117.

.3 After 2000 hours to continuous exposure, the coating shall exhibit no creep from scribe, no blistering, no red rust or softening.

335.2.6.3.3.3 .4 If any individual test panel fails any of the tests, noted in 335.2.6.3.3.3, the material shall not be accepted.

335.2.6.3.3 .4 Packaging and labelling

.1 The epoxy mastic coating shall be packaged in 2 containers, labelled part A and part B.

.2 The components shall be packaged in such proportions that the part A when mixed with the part B shall yield 45 litres of mixed paint.

.3 Each container shall bear a label on which shall be clearly shown the manufacturer or a brand name of paint, the lot number and the date of manufacturer.

.1 The label on the vehicle container shall also include complete instructions for the use of this paint.

.2 The container shall be coated if necessary to prevent attack by the paint components.

335.2.6.3.3 .5 Application

.1 The manufacturer's current printed instructions for application of aluminum epoxy mastic coating shall be submitted to the Engineer for review.

335.2.6.3.3 .6 Preparation

.1 The paint must be suitable for applying over steel which is thoroughly cleaned of contaminants, either by hand-cleaning (SSPC SP2) or power Tool cleaning (SSPC SP3) or abrasive blast cleaning (SSPC SP7).

335.2.6.3.3 .7 Coating System

.1 The epoxy mastic shall also be compatible with a wide range of topcoats which may be required for colours other than aluminum.

335.2.6.3.3 .8 Manufacturer and Brand Name Approval

.1 The manufacturer shall furnish reference and certify that the modified aluminum epoxy mastic has been used successfully for a period of at least five years in similar service and environment and that the material in such service was applied in one coat at a dry film thickness at 125 μm.

.2 Successful performance must include sustained adhesion to both steel and old coatings and must have sustained compatibility with suitable topcoats if required.

.3 Prior to approval and use of any aluminum epoxy mastic finish coat, the manufacturer shall, if requested, submit a test report showing specific test results Conforming to all quantitative and resistance test requirements of the Contract Documents.

    .1 In addition, the certified test report shall contain the lot numbers that all data is complied from and including but not limited to, the manufacturer's name, and brand name of paint.

.4 Upon approval of this test report, further resistance and quantitative tests shall not be required of that manufacturer for that brand name of paint unless just cause is shown that the existing test report may be inaccurate.

    .1 Just cause shall be considered as non-Conformance of random samples, tested, to any of the requirements herein specified.

.5 The manufacturer shall, upon request, submit new certified test results any time the manufacturing process on the paint formulation is changed.

.6 To obtain final acceptance of the epoxy-bitumen, the manufacturer shall upon request, furnish a certification stating that the material is formulated the same as the material tested for manufacturer and brand name approval.

.7 The Owner reserves the right to sample and test any or all materials supplied.

335.2.6 .4 High Build Aliphatic Polyurethane Finish Coat

335.2.6.4 .1 General

.1 The high build aliphatic polyurethane finish coat shall be a two component, high solids, high build, fast drying, spray applied coating with a satin or semigloss finish that is highly resistant to weather, abrasion, corrosive fumes, splash and spillage of acids, alkalies, solvents, salts and water.

.2 It shall provide adequate hiding when applied in a single coat directly over inorganic zinc primers and shall provide long-term colour and gloss retention.

.3 The coating shall be compatible with inorganic zinc primers, catalyzed epoxies, catalyzed phenols or other overcoats, as recommended by the coating manufacturer.

335.2.6.4.1.3 .1 The coating shall also be compatible to be used over most generic types of coatings which are tightly adhering and properly prepared.

335.2.6.4 .2 Mixed Paint

335.2.6.4.2 .1 General

.1 The two components of the system shall have a shelf life of 12 months minimum.

.2 The mixed material shall have a density of 1.15 ± 0.04 kg per litre.

.3 The pot life for the mixed material shall be four hours at 24 °C.

.4 The non-volatile content of solids by volume shall be 58 ± 1% for the mixed material.

.5 Drying time to handle shall be 5 hours at 24 °C.

335.2.6.4.2 .2 Resistance

.1 Test panels of steel meeting the requirements of ASTM D 609, having dimensions of 50 x 125 x 3 mm, shall be prepared by cleaning all surfaces.

.1 Cleaning

.1 Surfaces to be painted with inorganic zinc shall be blast cleaned with abrasives producing a nominal height profile of 40 μm.

.2 All oil, grease, dirt, rust scale and other foreign matter shall be completely removed except as herein after modified.

.3 All rust, mill scale and old paint shall be removed.

.4 At least 95% of each square 25 mm shall be free of all visible residues and the remainder shall be limited to light discoloration (SSPC SP10).

.5 Surfaces shall be cleaned to a condition at least equal to the appearance of the pictorial surface preparation standard, labelled SA 2-½ in ASTM D2200, that applies to the starting rust grade of the steel.

.6 Surfaces shall be cleaned to meet the requirements of SSPC SP10.

.2 A two-coat system of alkyl silicate zinc-rich primer and high build aliphatic polyurethane finish coat shall be applied to the test panels in accordance with the manufacturer's current instructions to the dry film thickness' as outlined in this specification for the actual Structure.

335.2.6.4.2.2 .3 The coating shall be cured as recommended by the manufacturer.

.4 Each of the following tests shall be performed:

335.2.6.4.2.2.4 .1 Salt Fog Resistance

.1 Panels shall be scribed down to the base metal with an "X" of at least 50 mm legs down to bare metal.

.2 The test panels shall then be tested in accordance with ASTM B 117.

.3 After 1,000 hours of continuous exposure, the coating shall show no loss of bond, nor shall it show rusting or blistering beyond 1.5 mm from the centre of the scribe mark.

335.2.6.4.2.2.4 .2 Weathering Resistance

.1 Panels shall be tested in accordance with ASTM G 23, Type D.

.2 The panels shall be placed on test at the beginning of the wet cycle.

.3 After 1,000 hours of continuous exposure, the coating shall show no rusting, loss of adhesion to the steel test panel or blistering.

335.2.6.4.2.2.4 .3 Adhesion Resistance

.1 Panels shall be tested in accordance with ASTM D 3359, Method B (Crosshatch Adhesion) and shall exhibit a rating of not less than 5 on the average of three tests.

335.2.6.4.2.2.4 .4 Humidity Resistance

.1 Panels shall be tested in accordance with ASTM 2247 and shall exhibit no blistering, cracking, softening or delamination of film after 600 hours exposure.

335.2.6.4.2.2 .5 If any individual test panel fails any of the tests, noted in 335.2.6.4.2.2, the material shall not be accepted.

335.2.6.4.2 .3 Packaging and labelling

.1 High build aliphatic polyurethane paint shall be packaged in two component containers or in two separate containers.

.2 The components shall be packaged in such proportions to yield the correct mixing ratio when the entire container is used.

.3 Each container shall bear a label on which shall be clearly shown the manufacturer or a brand name of paint, the lot number and the date of manufacturer.

335.2.6.4.2.3.3 .1 The label on the vehicle container shall also include complete instructions for the use of this paint.

.2 The container shall be coated if necessary to prevent attack by the paint components.

335.2.6.4.2 .4 Application

.1 The manufacturer's current printed instructions for application of high build aliphatic polyurethane coating shall be submitted to the Engineer for review.

335.2.6.4.2 .5 Manufacturer and Brand Name Approval

.1 Prior to approval and use of any inorganic zinc, the manufacturer shall submit to the Owner certified test reports from an approved independent testing laboratory showing specific test results Conforming to all quantitative requirements and resistance test requirements of the Contract Documents.

.1 In addition, the certified test report shall contain the exact ratio by weight, of the pigment component to the vehicle component of the paint used for the tests, the lot tested, the manufacturer's name, brand name of paint, and date of manufacture.

.2 To obtain final acceptance of the inorganic zinc, the manufacturer shall furnish a certification stating that the material is formulated the same as the material tested for manufacturer and brand name approval.

.3 The Owner reserves the right to sample and test any or all materials supplied.

335.2 .7 Formwork

.1 All formwork shall be carried out in accordance with Item 958.

335 .3 SUBMITTALS

335.3 .1 Qualifications of Fabricator

.1 The steel fabricator shall be a member in good standing of the Canadian Institute of Steel Construction.

.2 All fabrication of the steel Superstructure shall be carried out in a fabrication shop fully certified by the Canadian Welding Bureau to the requirements of CAN/CSA W47.1, Division 1, for bidding and Contract execution.

.3 The Structural Steel Fabricator shall note the requirements for documentation from the Canadian Welding Bureau that must be submitted with the Job Schedule, as described in the Contract Documents and in accordance with Item 906.

335.3 .2 Shop Drawings

.1 The Contractor shall submit shop drawings in accordance with Item 956 and with, but not limited to, the following additional requirements:

  .1 The Contractor shall prepare shop drawings of all metal Work and shall submit six copies of the shop drawings and 3 copies of certified mill reports to the Engineer for review.

  .2 The Contractor shall arrange to have the shop drawings in the hands of the Engineer five (5) weeks prior to the start of fabrication.

  .3 After the Engineer's review, the Contractor shall submit one complete set of plastic transparencies to the Engineer for his records of the as-built drawings, after all revisions have been made.

  .4 No fabrication shall be undertaken until the Engineer has returned the shop drawings to the Contractor.

  .5 The review of the Contractor's shop drawings by the Engineer, shall not relieve the Contractor of his responsibility for the correctness of his drawings.

  .6 All shop drawings, erection drawings, welding procedures, design briefs, and all other such documents shall be stamped and signed by a Professional Engineer registered or licensed to practice in the Province of New Brunswick.

335.3.2 .2 Shop Details

  .1 Shop drawings shall provide shop details which includes:

    .1 Full detail dimensions and sizes of all components and parts of the Structure;

      .1 These dimensions shall make allowance for changes in shape due to weld shrinkage, camber and any other effects which cause finished dimensions to differ from initial dimensions.

    .2 All necessary specifications for the materials to be used;

    .3 Identification of areas requiring special surface treatment;

    .4 Identification of fracture critical and primary tension members and component parts;

    .5 Bolt installation requirements;

    .6 Details of all welds.

.3 Symbols for welding and non-destructive test on shop drawings shall be in accordance with the provisions of CAN/CSA W59.

335.3 .3 Welding Procedures

.1 The Contractor shall submit the welding procedure specifications and welding procedure data sheets, Conforming to CAN/CSA W59 and CAN/CSA W47-1, to the Engineer at least two weeks in advance of fabrication and review must be obtained before commencing the Work.

.1 The following shall be included, but not limited to;

.1 The welding process to be used, the position of welding, filler metal, flux, shielding gas if required, joint configurations, number and size of passes, preheat and inter-pass temperatures if required, sequence of passes, current, rate of pass, electrode size, electrical stick-out and polarity, and methods of storing consumables.

.2 The methods that shall be used for the preparation of the edges.

.3 Measures which shall be taken to control the effects of distortion, shrinkage and residual stresses.

.4 The proposed methods and sequence of assembling.

.5 The welding Equipment which shall be used.

335.3 .4 Conformance

.1 The Contractor shall submit to the Engineer, at least two (2) weeks in advance of the steel fabrication, three (3) copies of a letter certifying that the stud shear connectors conform to 335.2.5.1.

335.3 .5 Erection

.1 The Contractor shall, prior to commencing the Work of erection, furnish the Engineer with erection procedure drawings, together with complete calculations of stresses in the steelworks in the various stages of erection and shall inform the Engineer fully as to the method of erection he proposes to use.

.2 The whole of this information shall be submitted to the Engineer for review, at least four weeks before the Work of erection is to commence and shall be stamped by a Professional Engineer who is registered or licensed to practice in the Province of New Brunswick.

.6 Submittals are required for this Item that are contained within the sections applicable to the specific phase of the Work being undertaken, separate and distinct to those listed here.

335.4 CONSTRUCTION

335.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

335.4 .2 Fabrication

335.4.2 .1 Fabrication Standards

.1 The fabrication of all structural steel shall Conform to the AASHTO 1992 Specification with latest revisions, AWS Specification D1.5 Bridge Welding Code and to CAN/CSA W59, except that all welding shall Conform to CAN/CSA W59 and CAN/CSA W47.1.

335.4.2 .2 Workmanship and Finish

.1 All edges of all members and plates, whether rolled, cut or sheared, that are exposed to view or weather in the finished assembly, and are to be coated, shall be rounded to a 1.5 mm minimum radius by grinding, prior to blast cleaning for assembly.

335.4.2 .3 Storage of Material

.1 Structural material, either plain or fabricated, shall be stored at the fabricator's shop or elsewhere above the ground upon platforms, skips or other suitable supports and shall be kept free from dirt and other foreign matter.

.2 Structural material, either plain or fabricated, shall be protected as far as practicable from corrosion.

.2 Long members shall be so supported as to prevent deflection.

335.4.2 .4 Shipping of Material

.1 Damaged members shall be repaired or replaced as required by the Engineer.

335.4.2 .5 Camber

.1 All plate girders shall be cambered to compensate for full dead load deflections and the vertical curve as may be required by the profile grade as shown in the Contract Documents.

  .1 The maximum error in girder camber shall conform to Clause 5.8 of CAN/CSA W59, except that the error shall not exceed ± 20 mm.

.2 Rolled sections may be heat cambered using an approved procedure, while plate girders shall have the required camber cut into the web with suitable allowance for camber loss due to cutting, welding, and heat-curving.

335.4.2 .6 Girder Splices

.1 The location of the field bolted main girder splices are shown in the Contract Documents.

  .1 Additional field splices or the relocation of the main bolted field splices shall not be allowed.

335.4.2.6 .2 The location of the shop-welded splices are shown in the Contract Documents.

.1 No other shop-welded splices shall be permitted without prior approval of the Engineer.

.2 Welded field splices of the main girders shall not be allowed.

.3 The locations of the main girder shop welded splices for the flanges are shown on the Contract Documents.

.4 Should the Contractor require additional shop welded complete penetration groove weld splices in the flanges, these shall only be permitted with the written approval of the Engineer.

.5 The location of complete penetration shop welded groove welds for the web plate shall be subject to the approval of the Engineer.

335.4.2 .7 Re-entrant Cuts

.1 A fillet of not less than 25 mm radius shall be provided at the junctions of all re-entrant cuts, and the fillet shall be formed before the cuts are made.

335.4.2 .8 Flame Cutting

.1 Steel may be flame-cut, provided a smooth surface is secured by the use of a mechanical guide.

.2 Flame cutting by hand shall be done only when approved by the Engineer, and the surface shall be made smooth by planing, chipping or grinding.

.3 The quality and repair of the cut edges shall conform to Clause 5 of CAN/CSA W59.

.4 All cut edges which are not to be welded shall have a surface roughness not greater than 1000, as defined by CAN/CSA B95.

335.4.2 .9 Fabrication Tolerances

335.4.2.9 .1 Structural Members

.1 Structural members consisting of a single rolled shape shall meet the straightness tolerances of CAN/CSA G40.20, except that columns shall not deviate from straight by more than 1/1000 of the length between points of lateral support.

.2 A variation of 1 mm from the detailed length is permissible in the length of members which have both ends finished for contact bearing.

.3 Other members without finished ends may have a variation from the detailed length of not more than 2 mm for members 10 m or less in length, or not more than 4 mm for members over 10 m in length.

335.4.2.9 .2 Abutting Joints

.1 When compression members are butted together to transmit loads in bearing, the contact faces shall be milled or saw-cut.

  .1 The completed joint shall have at least 75% of the entire contact area in full bearing, defined as not more than 0.5 mm separation, and the separation of the remainder shall not exceed 1 mm.

.2 At joints where loads are not transferred in bearing, the nominal dimension of the gap between main members shall not exceed 10 mm.

335.4.2.9 .3 Bearing Plates

.1 Bearing plates shall meet the following requirements:

  .1 Rolled steel bearing plates 50 mm or less in thickness may be used without planing provided that a satisfactory contact bearing is obtained.

.2 Rolled steel bearing plates over 50 mm but not over 100 mm may be straightened by pressing or by planning on all bearing surface to obtain a satisfactory contact bearing.

.3 Rolled steel bearing plates over 100 mm in thickness shall be planed on all bearing surfaces, except for those surfaces which are in contact with concrete foundations and are grouted to ensure full bearing.

335.4.2.9 .4 Fabricated Components

.1 Tolerances for welded components shall Conform to Clause 5.4 of CAN/CSA W59.

.2 Dimensional tolerances of welded structural members shall Conform to those prescribed in Clauses 5.8 and 12.5.3 of CAN/CSA W59.

.3 Built-up, bolted structural members shall satisfy the straightness tolerances of CAN/CSA G40.20 for rolled wide flanged shapes.

.4 Bearing stiffeners fitted to bear shall have a minimum bearing contact area of 75%, with a maximum separation of 1 mm over the remaining area.

.5 Fitted intermediate stiffeners shall have a minimum bearing contact area of 25%, and a maximum separation of 2 mm.

335.4.2 .10 Pre-assembly of Field Connections

335.4.2.10 .1 Shop Trial Assembly

.1 Girders and other main components shall be pre-assembled in the shop to prepare or verify the field-splices.

335.4.2.10.1 .2 Components shall be supported in a manner consistent with the finished geometry of the Bridge, as defined in the Contract Documents, with allowance for any camber required to offset the effects of dead-load deflection.

.3 Holes in the webs and flanges of main components shall be reamed or drilled to final size while in assembly.

  .1 The components shall be pinned and firmly drawn together by bolts before reaming or drilling.

  .2 Drifting done during assembly shall only be sufficient to align the holes and not to distort the steel.

  .3 If required, reaming shall be used to enlarge holes.

.4 Where a number of sequential assemblies are required because of the length of the Bridge, the second and subsequent assemblies shall include at least one section from the preceding assembly to provide continuity of alignment.

.5 Trial assemblies are required when the field-splices are bolted.

  .1 Each assembly shall be checked for camber, alignment, accuracy of holes, and fit-up of welded joints and milled surfaces.

    .1 Corrective Work, if necessary, shall be carried out.

335.4.2 .11 Hole Drilled using Numerically Controlled Machines

.1 As an alternative to the above trial assembly, when the bolt holes have been prepared by numerically controlled drilling or using a suitable template, the accuracy of the drilling may be demonstrated by a check assembly consisting of the first components of each type to be made.

.2 If the check assembly is satisfactory, further assemblies of like components are not required.

.3 If the check assembly is unsatisfactory for any reason, the Work shall be redone or repaired in a manner acceptable to the Engineer.

  .1 Further check assemblies shall be required as specified by the Engineer to demonstrate that the required accuracy of fit-up has been achieved.

335.4.2 .12 Welding, General

.1 All welding, including Workmanship, technique, qualification, etc., shall Conform to the requirements of CAN/CSA W59, except where modified by the following conditions;

335.4.2.12.1 .1 The electroslag and electrogas welding processes (see Clause 5 of CAN/CSA W59) shall not be used for welding quenched and tempered steels nor for welding components of members subject to tension stress or stress reversal.

.2 All shop splice welds shall be pre-qualified welds in accordance with CAN/CSA W59 and shall be subject to the approval of the Engineer.

.3 All groove welds in web and flange plates shall be done to the individual plates prior to the welding of flanges to the web plates.

  .1 No field groove welds shall be allowed.

335.4.2 .13 Repair Welding

.1 All welding corrections and repairs shall be performed according to CAN/CSA S6 00, clause 10.23, except as amended herein.

.2 Repair of base metal by welding, at the producing mill shall not be permitted.

.3 In addition to CAN/CSA S6, clause 10.23, non-critical repairs which may receive prior approval including the following:

  .1 The repair of welds requiring excavation of defects including porosity, slag, and lack of fusion, the repair of arc strikes and removal of tack welds not incorporated into a final weld;

  .2 The repair of gouges not more than 5 mm deep on otherwise satisfactory cut or rolled surfaces which may be repaired by machining or grinding without welding; the procedures recommended in Clause 5.3.2 of CSA Standard W59 shall be followed;

  .3 The repair of occasional gouges exceeding 5 mm , but not more than 10 mm in depth on edges not to be welded, which may be repaired by welding; the procedures recommended in Clause 5.3.2 of CSA Standard W59 shall be followed.

335.4.2 .14 Blast Cleaning - Painted Areas

.1 All steel that is to be painted shall be blast cleaned to Conform to "The Steel Structures Painting Council" specification SSPC SP10 No. 10 "Near-White Blast Cleaning".

.2 All steel surfaces of the top of the top flanges that are not to be painted shall be blast cleaned to Conform to "The Steel Structures Painting Council" specification SSPC SP6, No. 6, "Commercial Blast Cleaning".

.3 All oil and grease and any other surface contamination shall be removed according to the requirements of SSPC SP1 "Solvent Cleaning", before any other surface preparation is started.

335.4.2.14 .4 The blasting medium (silica sand, grit or shot) used shall be of a size that produces a surface profile acceptable to the manufacturer of the inorganic zinc coating being used.

.5 The Contractor shall supply the Owner with a letter from the inorganic zinc coating manufacturer stating that the proposed method, Equipment and materials used in the blast cleaning is acceptable.

  .1 No blast cleaning shall commence until the Owner is in possession of this letter.

.6 No blast cleaning shall be carried out when the surfaces of the steel are damp.

.7 The blast cleaned surfaces shall be coated with inorganic zinc before any rusting occurs.

.8 Under no circumstances are blast cleaned surfaces to be left uncoated overnight.

.9 If the blast cleaned areas become damp and/or rusted, these areas shall be re-blasted after the steel has dried.

.10 The Contractor shall ensure that all applicable safety precautions are taken during the blast cleaning operation.

.11 All surfaces to be painted shall be free from any or all contaminants.

335.4.2 .15 Blast Cleaning - Unpainted Areas

.1 All exposed steel surfaces shall be blast cleaned to Conform to "The Steel Structures Painting Council" specification SSPC SP6-63 "Commercial Blast Cleaning".

.2 The blast cleaning shall preferably be carried out after the complete erection of the structural steel, but may be carried out in the shop, provided the Contractor cleans the steel work of all cutting oil, dirt, erection marks or other foreign material after the completion of the erection.

335.4.2 .16 Inorganic Zinc Coating

.1 The inorganic zinc coating shall be mixed, applied to the near-white metal surface and cured at the proper temperature in accordance with the manufacturer's recommendations.

.2 All surfaces shall be completely free of dust and dirt prior to the application of the inorganic zinc coating.

.3 The inorganic zinc coating shall be applied to the metal surface with airless spray Equipment as recommended by the inorganic zinc coating manufacturer.

335.4.2.16 .4 The inorganic zinc primer is to be applied to all surfaces, except System C, of all structural steel, except the top surface of the top flanges of all composite deck girders and floor beams that are embedded in concrete, are to be unpainted, with the exception of a 25 mm strip along each edge, which shall be painted with the inorganic zinc primer.

.5 The top surface of the top flanges shall receive a commercial blast finish in accordance with Steel Structures Painting Council specification SSPC SP6 No. 6 "Commercial Blast Cleaning".

.6 The inorganic zinc primer shall be applied in the shop to all surfaces.

.1 All interior surfaces of the steel girders and all interior plates and rolled shapes shall receive a dry film thickness of 125 μm -10 or +15 μm.

.2 All interior surfaces of the box girders shall receive a dry film thickness of 100 ± 20 μm (one coat) and will not require a field coat.

.1 Surfaces to receive a dry film thickness of 100 ± 20 μm (one coat) but will not receive a field coat of high build aliphatic polyurethane paint shall include the top interior surface of the bottom flanges, the inside of all web plates, the top surfaces of the top flanges, the interior bottom surfaces and interior edges of the top flanges, all interior stiffeners and bracing, all interior diaphragms and all faces of deck support angles.

.3 For Systems A and/or B, all exterior surfaces of box girders and all cross frames and diaphragms shall receive a dry film thickness of 75 ± 10 μm (one coat).

.1 These surfaces shall be painted in the field with one coat of high build aliphatic polyurethane to a minimum dry film thickness of 125 μm.

.2 These surfaces shall include the exterior bottom and side surfaces of the bottom flanges, the exterior surfaces of all web plates, the underside and sides of all top flanges (exterior faces), the exterior faces of deck support angles and all exterior faces of external cross frames and diaphragms.

335.4.2 .17 High Build Modified Aluminum Epoxy Mastic Coating

.1 The high build, modified aluminum epoxy mastic coating shall be mixed, applied to the zinc rich primed surface and cured at the proper temperature in accordance with the manufacturer's recommendations.

.2 All surfaces shall be free of dust, dirt, moisture, oil or grease prior to the application of the high build, modified aluminum epoxy mastic coating.

.1 Oil and grease shall be removed with a thinner as recommended by the manufacturer of the paint system.

335.4.2.17 .3 The Contractor shall note that the inorganic zinc coating is to be applied in the shop and a time period may elapse before applying the field coat of high build, modified aluminum epoxy mastic.

.4 The Contractor shall clean all surfaces, that are to be painted with high build, modified aluminum epoxy mastic, in the field at the site insuring that they are free of all salt and contaminants.

.5 The method of cleaning in the field must be acceptable to the coating manufacturer and approved by the Engineer.

.6 For System B, the two top coats of aluminum epoxy mastic shall be applied in the field to all steel surfaces with the exceptions that:

  .1 the top surface of the top flanges of the main girders shall not be painted.

  .2 the faying surface between the underside of the girder and the top of the tapered shoe plate shall not be painted. Each field coat shall have a dry film thickness of 150 ± 20 μm.

.7 All exterior surfaces of the steel girders, cross frames and all exterior plates and welded shapes that received a shop coat of inorganic zinc primer (one coat) with a dry film thickness of 75 microns (-10 or +15 microns) shall be painted in the field with two coats of high build, modified aluminum epoxy mastic paint excepting the top surface of the top flanges of the main girders, as further detailed in the Contract Documents.

  .1 Each field coat shall have a dry film thickness of 125 + 20 μm.

.8 The top surfaces of the girder and floor beam top flanges that are to be embedded in concrete, shall receive the first coat of aluminum epoxy mastic paint topcoat within a distance of 25 mm from the exterior edges.

.9 No other aluminum epoxy mastic paint is to be applied to the top surfaces of the top girder flanges that are to be embedded in the concrete deck.

.10 The Contractor shall employ such measures as necessary to ensure that the aluminum epoxy mastic paint is confined to the above 25 mm width.

.11 The Contractor shall note that the high build, modified aluminum epoxy mastic coating is to be applied in the field after steel erection.

.12 The Owner may entertain proposals from the Contractor to apply the first top coat of aluminum epoxy mastic paint in the shop.

  .1 Approval of such proposals is not implied and remains the discretion of the Engineer.

335.4.2.17 .13 The high build, modified aluminum epoxy mastic coating shall be applied to the steel surface with airless spray Equipment as recommended by the manufacturer of the paint.

.14 All field painting operations shall be isolated from the environment and abutments by full enclosure consisting of vertically hung, overlapping tarpaulins or permeable sheeting on all sides with overhead cover and ground sheets.

.1 The Contractor shall assume full liability for the result of his actions in the event that paint contamination and/or damage occurs to any public or private property.

.15 The Contractor shall take due care to protect passing vehicles, etc., from overspray in all field painting operations.

.1 The Contractor shall be fully responsible and assume full liability for the result of his actions in the event that overspray should occur to any public or private property.

.16 Each field coat shall have a dry film thickness of not less than 150 + 20 μm.

.17 The Contractor shall take due care to protect the piers and abutments against overspray.

.1 The Contractor shall be responsible to remove and clean any such oversprayed surface to the satisfaction of the Engineer.

335.4.2 .18 High Build Aliphatic Polyurethane Coating

.1 The high build polyurethane coating shall be mixed, applied to the zinc rich primed surface and cured at the proper temperature in accordance with the manufacturer's recommendations.

.2 All surfaces shall be free of dust, dirt, moisture, oil and/or grease prior to the application of the coating.

.3 Oil and/or grease shall be removed with a thinner as recommended by the manufacturer of the paint system.

.4 The high build polyurethane coating shall be applied in the field after the steel erection.

.5 The polyurethane coating shall be applied to the steel surface with airless spray Equipment as recommended by the manufacturer of the paint.

.6 The Contractor shall take due care to protect the piers and abutments against overspray.

.1 The Contractor shall be responsible to remove and clean any such oversprayed surface to the satisfaction of the Engineer.

335.4.2 .19 Field Touch-up of Paint

.1 Field touch-up of the damaged areas of the inorganic zinc coating shall be carried out in accordance with 335.4.2.16, except that brush application may be used in lieu of airless spray Equipment.

.2 Field touch-up shall be done with a primer that is recommended by the paint manufacturer and approved by the Engineer for compatibility with the inorganic zinc shop primer and/or the galvanized bolts.

  .1 Field touch-up shall be done with Tnemec 50-330 Primer for paint System "A" or Galvanox Type I for paint System 'B".

  .2 Field priming of galvanized bolts shall be done with Tnemec 50-330 Primer for paint System "A" or Galvanox Type I for paint System 'B".

.3 Field touch up of damaged areas of the finish coating shall be carried out in accordance with either 335.4.2.15 or 335.4.2.16, after first cleaning the affected areas and re-priming with zinc-rich primer to the satisfaction of the Engineer.

.4 The Contractor should note that brush application of the finish aluminum epoxy mastic coating is not permissible, and shall ensure that repaired areas are carefully and aesthetically blended to match with original paint finish. This is of particular concern for exposed fascia girders.

335.4.2 .20 Surface Condition of Bolted Parts

.1 All bolted connections are friction type connections and are designed for standard size bolts.

.2 The surface condition for bolted friction connections for painted Structures with coated joints shall be blast cleaned and coated with Class B inorganic zinc silicate coating conforming to the requirements of AASHTO (1996) Table 10.32.3C and to CAN/CSA S16.1 (1994) Clause 13.12.2 for Class B Contact Surface of Bolted Parts.

  .1 The surface condition for bolted friction connections for unpainted Structures with uncoated bare joints shall be blast cleaned, conforming to the requirements of AASHTO (1996) Table 10.32.3C and to CAN/CSA S16.1 (1994) Clause 13.12.2 for Class B Contact Surface of Bolted Parts.

.3 The faying surfaces of connections designed as Class A, B, or C, shall be prepared as specified in the following;

  .1 For clean mill scale, the surfaces shall be free of oil, paint, lacquer, or any other coating for all areas within the bolt pattern and for a distance beyond the edge of the bolt hole that is the greater of 25 mm or the bolt diameter.

  .2 For Classes A and B, the surfaces shall have the same blast cleaning and coating application as used in the tests to determine the mean slip coefficient.

335.4.2.20.3.2 .1 Coated joints shall not be assembled before the coating has cured for the minimum time used in the tests to determine the mean slip coefficient.

.3 For Class C, the surfaces shall be hot-dip galvanized in accordance with CAN/CSA G164 and the surface subsequently roughened by means of hand wire brushing.

.1 Power wire brushing is not permitted.

335.4.2 .21 Facing of Bearing Surfaces

.1 The surface finish of bearing and base plates and other bearing surfaces that are to come in contact with each other or with bearings or concrete shall meet the ANSI surface roughness requirements as defined in the 1993 interim AASHTO specification, Division II, Section 11.

.2 Surfaces of flanges which are in contact with bearing sole plates shall be flat within 0.5 mm over an area equal to the projected area of the bearing stiffeners and web.

.1 Outside this area 2 mm deviation from flat is acceptable.

.2 The bearing surface shall be perpendicular to the web and bearing stiffeners.

335.4 .3 Fracture Control

335.4.3 .1 General

.1 The provisions of this clause shall apply to members designated as fracture critical and primary tension members as identified in the Contract Documents.

335.4.3 .2 Identification

.1 Shop drawings shall identify the extent of fracture critical and primary tension members.

.2 Attachments having a length of more than 100 mm in the direction of tension and welded to the tension zone of a fracture critical or primary tension member shall be treated as part of that member.

.3 For each component of a fracture critical or primary tension member, records are to be kept to identify the heat number of the material and its corresponding mill test certificate.

335.4.3 .3 Fracture Toughness Requirements

.1 The Charpy V-notch requirements given in the Tables 335-2, 335-3 and 335-4 are for standard full-size specimens.

.1 For plates from 8 mm to 11 mm in thickness, sub-sized specimens with adjusted energy levels may be used as permitted by CAN/CSA G40-20.

335.4.3.3.1 .2 Requirements apply to both bolted and welded construction.

.2 For fracture critical members, Charpy V-notch tests shall be specified on a per plate frequency, and the steel shall meet the impact requirements given in Table 335-2.

Table 335-2
Impact Test Temperatures And Charpy Impact Energy Requirements For Fracture Critical Members

Grade G40.21	Minimum Average Energy Joules	Test Temperature T_t For Minimum Service Temperature, T_s		
		$T_s \geq -30°C$	$-30°C > T_s \geq -60°C$	$T_s < -60°C$
Commonly used steels				
260 WT	34	0°C	-20°C	-40°C
300 WT	34	0°C	-20°C	-40°C
350 WT and AT	40	0°C	-20°C	-40°C
400 WT and AT	40	0°C	-20°C	-40°C
These steels may be used if approved				
480 WT and AT	40	-10°C	-40°C	-60°C
700 QT	50	-20°C	-40°C	-60°C

335.4.3.3 .3 For primary tension members, Charpy V-notch tests shall be specified on a per heat frequency, and the steel shall meet the impact energy requirements given in Table 335-3, or as specified in 335.2, whichever governs.

Table 335-3
Impact Test Temperatures And Charpy Impact Energy Requirements For Primary Tension Members

Grade G40.21	Minimum Average Energy Joules	Test Temperature T_t For Minimum Service Temperature, T_s		
		$T_s \geq -30°C$	$-30°C > T_s \geq -60°C$	$T_s < -60°C$
Commonly used steels				
260 WT	20	0°C	-20°C	-30°C
300 WT	20	0°C	-20°C	-30°C
350 WT and AT	27	0°C	-20°C	-30°C
400 WT and AT	27	0°C	-20°C	-30°C
These steels may be used if approved				
480 WT and AT	27	-10°C	-30°C	-40°C
700 QT	34	-20°C	-40°C	-50°C

335.4.3.3 .4 Service Temperature

.1 The applicable minimum service temperature, T_s shall be the minimum daily mean temperature taken from "Canadian Climate Normals" published by Environment Canada.

335.4.3.3 .5 Steel For Permanent Backing Bars

.1 Steel for permanent backing bars shall meet the requirements of Clause 5.5.1.1 of CAN/CSA W59 and shall meet the CVN requirements of Tables 335-2 and 335-3 as appropriate.

335.4.3.3 .6 Weld Metal Toughness Requirements

.1 For fracture critical and primary tension members, the weld metal shall meet the impact requirements of Table 335-4.

Table 335-4
Impact Test Temperature And Charpy V-Notch Impact Requirements For Weld Metal

Base Metal Grade G40.21	Minimum Average Energy Joules	Test Temperature T_t For Minimum Service Temperature, T_s	
		$T_s \geq -40°C$	$T_s < -40°C$
260 WT	20	-30°C	-40°C
300 WT	20	-30°C	-40°C
350 WT and AT	27	-30°C	-40°C
400 WT and AT	27	-30°C	-40°C
480 WT and AT	27	-45°C	-45°C
700 QT	40	-45°C	-45°C

335.4.3 .4 Welding Fracture Critical and Primary Tension Members

.1 The requirements of 335.4 shall apply and as supplemented herein.

.2 Except as permitted by 335.4.3.4.6, only welding consumables certified by the CWB to an appropriate CAN/CSA W48, or to AWS A5 if no appropriate W48 standard exists, that includes Charpy V-notch toughness requirements meeting the requirements of Table 335-4, shall be used.

.3 In groove welds connecting two different grades of steel, the classification of consumables used, including CVN impact requirements, shall be that applicable to the grade having the lower ultimate tensile strength.

335.4.3.4 .4 For groove welds in fracture critical and primary tension members using certified consumables where the CVN test temperature required by Table 335-4 is lower than the test temperature in the CAN/CSA W48 or AWS A5 classifications, or where the standards are not applicable, welding consumables shall be approved by the CWB and qualified using a verification test assembly to establish the impact properties of the weld metal.

  .1 Testing procedures shall follow those of the relevant CAN/CSA W48 or AWS standard, except that only CVN tests are required and that welding shall be carried out using the preheat and the maximum heat input to be used in practice.

  .2 CVN results shall meet the requirements of Table 335-4.

  .3 Qualifications are required for each electrode diameter used and for the consumables supplied by each manufacturer.

    .1 The qualification is valid for consumables for all groove weld procedures of the same or lower heat input as that used in the qualification test.

.5 For groove weld procedures in fracture critical and primary tension members of 700 Q and 700 QT material, consumables shall be qualified by welding procedure tests approved by the Canadian Welding Bureau.

  .1 Tests shall be conducted according to CAN/CSA W47.1 using 700 Q of 700 QT material for the base plate and shall include weld metal and heat affected zone CVN impact tests according to CAN/CSA W47.1 Appendix D.

  .2 Weld metal impact tests shall meet the requirements of Table 335-4 and HAZ impact tests shall meet the requirements of Table 335-2 or Table 335-3 for the base plate as appropriate.

  .3 Only consumables supplied by the manufacturer supplying those qualified shall be permitted in fabrication.

    .1 The qualification is valid for all groove weld procedures with the same or lower heat input as that used in the qualification test.

.6 When the welding consumables have not previously been certified by the Canadian Welding Bureau, consumables shall be qualified by welding procedure tests in accordance with the provision of Clause 8.2.2.4 of CAN/CSA W47.1 and shall include CVN impact tests of the weld metal.

  .1 For steels other than 700 Q and 700 QT CVN tests in the HAZ are not required.

  .2 Weld metal CVN properties shall be established by qualification tests in accordance with CAN/CSA W47.1 (including appendix D) and shall meet the requirements of Table 335-4.

335.4.3.4.6 .3 Only consumables supplied by the manufacturer who provided those qualified shall be permitted in fabrication.

.4 Qualification shall be done for each lot or batch of consumables.

.5 The qualification is valid for all weld procedures with the same of lower heat input as that used in the qualification test.

.6 Consumables for 700 Q and 700 QT materials shall be qualified according to 335.4.3.4.5.

.7 Tack welds shall not be used on fracture critical or primary tension members unless they are incorporated into the final weld.

.1 Temporary welds shall not be used on fracture critical, primary tension members and flange material in compression, unless approved by the Engineer.

335.4.3 .5 Repair Welding

.1 All welding corrections and repairs shall be performed according to CAN/CSA S6 1988, clause A2.2, except as amended herein.

.2 Repair of base metal by welding, at the producing mill shall not be permitted.

.3 In addition to CAN/CSA S6, clause A2.2.4, non critical repairs which may receive prior approval include the following:

.1 The repair of welds requiring excavation of defects including porosity, slag, and lack of fusion; the repair of arc strikes and removal of tack welds not incorporated into a final weld;

.2 The repair of gouges not more than 5 mm deep on otherwise satisfactory cut or rolled surfaces which may be repaired by machining or grinding without welding; the procedures recommended in Clause 5.3.2 of CSA Standard W59 shall be followed;

.3 The repair of occasional gouges exceeding 5 mm, but not more than 10 mm in depth on edges not to be welded, which may be repaired by welding; the procedures recommended in Clause 5.3.2 of CSA Standard W59 shall be followed.

335.4 .4 Construction Requirements for Structural Steel

335.4.4 .1 Fabrication of Curved Girders

.1 A detailed procedure for the heat-curving operation shall be submitted for review.

  .1 The procedure shall describe the type of heating to be employed, the extent of the heating patterns, the sequence of operations, and the method of support of the girder, including an assessment of any dead-load stresses present during the operation.

.2 Transverse web stiffeners may be welded in place either before or after the heat-curving operation.

  .1 However, unless allowance is made for the longitudinal shrinkage, bracing connection plates and bearing stiffeners shall be located and welded after curving.

.3 Girders shall be cambered before heat-curving.

335.4 .5 Erection

335.4.5 .1 General

.1 The erection procedure drawings and calculations shall fully illustrate the proposed method of erection including the sequence of erection, the weights and lifting points of the members, and the location and lifting capacities of the cranes used to lift them.

  .1 Details of temporary bracing and bents to be used during construction shall be shown.

  .2 Calculations shall be provided to show the members and supports are not overloaded during erection.

.2 The Contractor shall erect the whole of the fabricated structural steel Work which he supplies under the Contract.

.3 The Contractor shall erect the structural steel in accordance with the requirements of the AASHTO 1992 and CAN/CSA S6.

.4 Components shall be lifted and placed, using appropriate lifting Equipment, temporary bracing, guys or stiffening devices so that they are at no time overloaded or unstable.

.5 Additional permanent material may be provided, if approved, to ensure that the member capacities are not exceeded during erection.

335.4.5.1 .6 All falsework, including necessary foundations, required for the safe construction of the Bridge shall be designed, furnished, maintained and removed by the Contractor.

.1 The Contractor shall not use any of the material intended for use in the finished Bridge for temporary purposes during erection, unless such use is approved.

.7 All temporary falsework towers, cables, dampers, etc., shall be removed from the erected steelworks following complete erection of the steelworks.

.8 Any additional bracing or guys required, other than those shown in the Contract Documents, to maintain the stability for the construction stage shall only be removed by the Contractor at a time that is mutually suitable to the Engineer and the Contractor.

.9 The company undertaking field-welding shall be certified to Division 1 of CAN/CSA W47.1.

.10 Tack welds used for attachments, or for any other purpose, are expressly forbidden unless they subsequently become part of welds detailed in the Contract Documents.

.11 The use of tack welds which are not part of the welds detailed in the Contract Documents, shall not be made on any portion of the girders.

.12 The Substructure shall be protected, under a separate Item as specified in the Contract Documents, against rust-staining by water run off from the Bridge.

335.4.5 .2 Erection and Construction Stresses

.1 The Contractor shall assume full responsibility to verify all Bridge components for erection stresses and shall provide any additional steel and/or bracing, if required, for his erection procedure.

.2 The Contractor shall not commence erection until the Engineer has received and reviewed these calculations, along with erection stresses and erection methods.

.1 Review of these calculations shall not relieve the Contractor of his responsibility to maintain overall stability of the steel in the construction phase.

.3 Under no circumstances may stresses occurring in the members of the Structure exceed the basic allowable stresses, except with the express permission of the Engineer.

.1 All allowable stresses shall be based upon CAN/CSA "Design of Highway Bridges" CAN3 S6 or the AASHTO Standard Specification for Highway Bridges - 1992 with the latest Interim Specifications.

.4 Release of temporary supports or temporary members, etc. must be gradual, and under no circumstances shall a sudden release be permissible.

335.4.5.2 .5 The method of erection proposed to be used shall be subject to the authorization of the Engineer, but such authorization shall not relieve the Contractor of any responsibility for the safety of the proposed method of erection, or of the Equipment, or from carrying out the Work in full accordance with the Contract.

.1 The Contractor shall not start any erection operation before this authorization is obtained.

335.4.5 .3 Erection Methods and Equipment

.1 The Contractor shall ensure that all cranes, rigging and Equipment are in good condition and properly maintained at all times during the period of the Work.

.2 The Contractor shall ensure that all cranes, rigging and Equipment is of adequate capacity to carry out the required steel erection.

.3 The Engineer shall have the right to inspect all Equipment to be used for the erection to satisfy himself that such Equipment is of good quality, and he may forbid the use of any Equipment that is, in his opinion, in any way faulty.

.1 The inspection of the erection Equipment by the Engineer shall in no way relieve the Contractor of his primary responsibility for the safety and adequacy of all erection methods and Equipment.

.4 All structural steelworks shall be handled in such a manner, so as to prevent shock or impact loadings to any steel member or Substructure component.

.5 Slings and other lifting apparatus used in the handling of structural steelworks shall be of a type which will not damage shop primed or painted surfaces of fabricated steelworks.

335.4.5 .4 Falsework and Guys

.1 The Contractor shall construct, erect, maintain and subsequently remove and dispose of all falsework and guys required for the erection of the Work.

.3 Falsework shall include all temporary supports and foundations and shall be properly designed and substantially constructed and maintained to sustain the loads which shall come upon it.

.4 Falsework shall be carried out in accordance with Item 957.

335.4.5 .5 Field Assembling of Steel

.1 Insofar as the cantilever method of erection is followed, the splice or splices which connect a member to the part of the Structure already erected shall be fully bolted before any further members are put in place.

.2 Cylindrical erection pins for use in shop-reamed holes shall be machined to a push fit so as to obtain an accurate matching of corresponding holes.

335.4.5.5 .3 Shop reamed holes shall not be re-reamed on the site.

335.4.5 .6 High Strength Bolts

.1 High strength bolts shall be installed and inspected in accordance to "Specification for Structural Joints using ASTM A325 or ASTM A490 bolts" approved by the Research Council on Bolted Structural Joints of the Engineering Foundation and AASHTO 1992 specifications with latest revisions.

.2 The "turn-of-the-nut" method shall be used for tightening bolts.

  .1 The Contractor shall supply personnel to assist in inspecting all high strength bolted connections for Conformance to the job inspection torque and the Contract Documents.

.3 The Contractor shall pay particular attention to the lubricant required for the nuts and additional test requirements required for galvanized bolts.

335.4 .6 Quality Control

335.4.6 .1 Responsibility

.1 It is the Contractor's responsibility to supply the material and execute, complete and maintain the Work in strict accordance with the terms of the Contract, and inspection and testing by the Engineer shall not be deemed to relieve the Contractor of any of his obligations.

335.4.6 .2 Inspection

.1 Inspection by the Engineer may extend to all or any part of the Work and to the preparation, fabrication or manufacture of any of the materials.

.2 The Engineer shall be furnished by the Contractor with such information as is required to make a complete and detailed inspection and shall be allowed access to all parts and phases of the Work.

.3 Any Work done or materials used without supervision or inspection by the Engineer may be ordered to be removed and replaced at the Contractor's own expense.

335.4.6 .3 Owner's Representative

.1 An Owner's representative shall be assigned to the project to report to the Engineer on the progress of the Work as a whole and the manner in which they are being performed, to secure adherence to the requirement of the Contract, to report on any noted failure by the Contractor to fulfil the requirements of the Contract and to direct the Contractor's attention to such failure.

.2 Testing engineers and inspectors may be appointed by the Engineer to fulfil duties similar to those of the Engineer in connection with various aspects of the Work and to carry out the testing of materials and Work.

335.4.6.3 .3 The Engineer's representative(s) shall, within the limits of the written authorization given them by the Engineer, have authority to reject material or Work that is not in Conformity with the requirements of the Contract, but no representative of the Engineer shall have authority to revoke, alter, enlarge, relax or release any requirement of the Contract.

.4 No representative of the Engineer shall perform any duty or management on the Contractor's behalf.

.5 The Contractor shall provide regular and practically located office space at his steel fabrication plant to accommodate the Engineer or the Owner's representative.

  .1 The office space so provided shall be ventilated, heated, lighted and clean and shall be furnished with a suitable standard office desk and chair.

    .1 The office room temperature shall be maintained at 20°C.

  .2 Convenient telephone, facsimile, photocopy, mail and message handling services shall also be provided.

335.4.6 .4 Samples and Testing

.1 The Engineer shall have the right to call for any additional samples, specimens and tests that are, in his opinion, necessary to secure proper quality control of the material and the Work.

.2 The Contractor shall bear all costs for the provision, preparation and testing of samples and specimens, including the costs of re-inspection and retesting as associated with Work not meeting the requirements of the Contract Documents.

.3 The Owner shall bear the costs and fees of the testing engineer and other representatives of the Engineer.

335.4.6 .5 Transfer of Heat Numbers

.1 The Contractor shall transfer heat numbers on plates for flanges, webs and diaphragm plates in the presence of the Inspector.

.2 Heat numbers are not to be stamped on plates but shall be marked with chalk or crayon in the presence of the Inspector.

.3 The Contractor shall prepare a drawing indicating the heat number of steel used for various components of the steel Superstructure.

335.4.6 .6 Inspection of Welds

.1 The Engineer reserves the right to submit welds, chosen at random, to non-destructive testing.

335.4.6.6.1 .1 If faults in the welds are discovered, the Engineer may order such additional testing as he may consider necessary to satisfy himself as to the overall quality and Workmanship of the welded construction.

.2 Any welds found to be faulty shall be removed, re-welded and retested at the Contractor's own expense.

.3 The amount and location of non-destructive testing shall be determined by the Engineer.

.4 In general, the following minimum testing shall be conducted.

.1 All welds shall be visually inspected.

.2 Groove welds in flanges and webs of built-up members shall be tested radiographically as follows:

.1 All flange tension splices and flange splices subject to stress reversal shall receive 100% radiographic inspection.

.2 Web splices shall receive 100% radiographic inspection for ½ of the depth beginning at the point or points of maximum tension and 25% of the remainder of the web splice shall be so tested.

.3 Flange compression splices shall receive 25% radiographic inspection.

.3 Web to flange fillet welds shall be subject to magnetic particle inspection in accordance with Table 355-5.

Table 335-5
Magnetic Particle Inspection Sequence

Submerged arc welds	25 percent of length
Semiautomatic welds	50 percent of length
Manual welds	100 percent of length

335.4.6.6.4 .4 Fillet welds for attaching gusset plates, diaphragm welds and stiffeners shall have 25% of the total tested by magnetic particle inspection.

.5 All transverse welds on tension flanges shall receive magnetic particle inspection.

.6 All gusset plates and stiffeners for attaching diaphragm bracing shall be tested for 100% of the length from the mid depth of the web to the tension flange.

.5 Radiographic ultrasonic testing shall be performed prior to assembly of the flanges to the web.

.6 In the event that defects are found, all welds shall be tested and all inferior welding shall be corrected and retested, at the Contractor's own expense.

335.4.6 .7 Repair of Welds

.1 Any welds which do not meet the acceptance standards shall be removed, re-welded and re-tested.

.2 The repair and non-destructive testing of fracture-critical and primary-tension members shall be in accordance with 335.4.2.

335.4.6 .8 Standards of Acceptance of Defects

.1 The standards of acceptance of defects shall be in accordance with CAN/CSA W59 "Welded Steel Construction (Metal Arc Welding) Clause 12 - Dynamically Loaded Structures".

335.4.6 .9 Inspection of Coating System

.1 Each Day's Work shall be inspected by the Engineer not later than the Day following application of the coatings.

.2 Blast cleaned faces, scheduled for painting, are to be approved by the Engineer before the start of the inorganic zinc coating application.

.3 Inspection by the Engineer shall not relieve the Contractor of the responsibility for furnishing the qualified labour, Equipment, staging etc. necessary to meet the requirements of this specification, or the accessibility of the Work piece for the purposes of inspection.

.4 Inspection of the completed coatings shall be based upon Elcometer or other magnetic detector readings.

.5 Detection of inadequately coated sections shall be indicated upon inspection by circling the area to be recoated with chalk or other appropriate means.

  .1 If such areas are close together, the Engineer may require re-coating of the entire surface within the affected portion(s).

  .2 Re-inspection of the replaced portion(s) shall be satisfactory to the Engineer.

  .3 Inorganic Zinc Coating

    .1 Where rejection of the inorganic zinc coating is due to poor Workmanship or similar deficiency in the quality of the Work or materials, the Contractor shall be required to blast clean the entire defective sections of all previously applied material prior to re-spraying.

    .2 The cost of repairing and re-inspecting the coating shall be borne at the Contractor's own expense.

335.4.6.9.5 .4 High Build Modified Aluminum Epoxy Mastic or-Aliphatic Polyurethane Coatings

.1 Where rejection of the high build, modified aluminum epoxy mastic or Aliphatic Polyurethane - coating is due to poor Workmanship or similar deficiency in the quality of the Work or materials, the Contractor shall be required to remove the entire defective section of the coating prior to re-application.

.2 At the discretion of the Engineer, an occasional spot test may be made using a sharp chisel (or other means) to remove a small section of the coating to physically gauge the coating thickness as a "proof" test. Where such tests are made, the areas shall be recoated at the Contractor's own expense.

335.5 MEASUREMENT FOR PAYMENT

.1 The labour, Equipment and materials required for, but not limited to, the loading, shipping, supply, fabrication, surface preparation, painting, delivery and erection of the complete steel Superstructure in accordance with this Item shall be on a lump sum basis.

335.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

.2 The Contractor may be granted progress payments in accordance with the Terms of Payment A section 4 and;

  .1 The Contractor shall provide the Engineer, at the time of signing of the Contract, a breakdown of the Lump Sum Price, including but not necessarily limited to, identifying the portion of the price attributable to the supply of materials to the fabricator's shop (structural plate and rolled shapes), steel fabrication, shop painting preparation and application, material transportation, erection and painting but excluding temporary access Structures, temporary erection supports and fasteners.

  .2 The Owner shall take ownership of the materials and Work covered by the progress payment, however the Contractor shall assume the full responsibility for the care and maintenance for all such materials until placed and accepted in the Structure.

    .1 The Contractor shall be solely responsible to repair or replace, at his own expense, any materials or components of the Work which become damaged or lost between the period of the progress payment and the inclusion of the materials or components into the Work.

341.1 DESCRIPTION

.1 This Item consists of the supply and installation of steel reinforced bearings.

341.2 MATERIALS

341.2 .1 General

.1 All materials shall be supplied by the Contractor and shall conform to the requirements of CAN/CSA S6.

.2 The bearings shall be of an approved type sufficient to provide as a minimum, the loading and movement capacities indicated in the Contract Documents.

.3 The elastomer used in the bearings shall be 100% virgin natural polyisoprene of nominal 55 ± 5 durameter hardness having properties conforming to the requirements of CAN/CSA S6.

.4 The elastomer compound used in the bearings shall conform to Grade 5 low temperature behaviour.

.5 The steel laminations incorporated into the bearings shall be rolled mild steel sheets, with a minimum yield strength of 230 MPa and not less than 3 mm nor more than 5 mm in thickness.

.6 The rubber/steel bearings must be moulded as complete units.

  .1 Vulcanizing or otherwise bonding rubber sheet to bearings cut from larger moldings shall not be accepted.

.7 Bearing pressures, compressive deflections, rotation and shear deformations shall conform to the limits as specified in CAN/CSA S6.

.8 Where indicated on reference bearings, all bearings shall be supplied complete with locating dowels and PVC caps.

  .1 The minimum effective rubber thickness shall take into consideration the effect of dowel penetration.

.9 The effective rubber thickness, denoted as T in CSA Standard CSA S6 and T_e in Table 341-2, shall be the sum of the thicknesses of all laminates with a shape factor less than or equal to 12.

.10 Bearings shall be stored at least 100 mm off the ground in a weatherproof enclosure.

341.2 .2 Elastomers

.1 The elastomers shall conform to the following:

342.4.1.3.6 .2 The maximum contact pressures at the extreme edges of flat and curved TFE elements shall not exceed 1.2 times the values given in Table 342-4.

.3 The average contact pressure at serviceability limit state Combination 1 loads for filled TFE elements used to face mating surfaces for guides for lateral restraint shall not exceed the following:

.1 TFE filled with up to 25% by mass of glass fibres 45 MPa;

.2 Lead filled TFE in a bronze matrix 60 MPa.

342.4.1.3 .7 Coefficient Of Friction

.1 The coefficient of friction between stainless steel and lubricated virgin TFE shall not exceed the values given in Table 342-5 and shall be interpolated linearly for contact pressures within the range given.

Table 342-5
Coefficient Of Friction

Contact Pressure MPa	Coefficient of Friction
10	0.06
25 and above	0.03

342.4.1 .4 Guide For Lateral Restraint

.1 The guides for lateral restraint shall be arranged to permit the required rotations about both the horizontal and the vertical axis.

.2 Unless the guide bars are machined from the solid they shall be bolted and recessed not less than 5 mm into the plate to which they are attached.

.3 The translational elements of guides for lateral restraint shall be faced with stainless steel and shall provide lateral restraint by sliding against mating surfaces faced with TFE Conforming to 342.2.12 and 342.2.13.

.4 Lead filled TFE shall be at least 2 mm thick and shall be mechanically fastened and bonded to the substrate.

.5 Glass fill or virgin TFE shall be recessed and bonded to the substrate to Conform to 342.4.1.3.5.

342.4.1 .5 Top And Base Plates

.1 The top and base plates which are permanently attached to the Structure shall be provided with the bearings and shall Conform to the requirements of the bearing and the Structure.

341.2.2.1 .1 Virgin natural polyisoprene shall be the only raw polymer permitted.

.2 The physical properties of the polyisoprene used shall conform to the requirements of Table 341-1.

Table 341-1
Physical Properties of Polyisoprene

Property	Test	Requirements
Hardness, °Shore A	ASTM D2240	55 ± 5
Tensile Strength, MPa	ASTM D412	min. 17.0
Ultimate Elongation, %	ASTM D412	min. 400
Heat Resistance	ASTM D573	70h at 70°C
Change in hardness, °Shore A		max. +10
Change in tensile strength, %		max. -25
Change in ultimate elongation, %		max. -25
Compression Set, %	ASTM D395 Method B	22h at 70°C max. 25
Ozone	ASTM D518 Mounting Procedure A 20% strain 40 ± 2°C	25 pphm, 48 h no cracks
Bond between steel and Elastomer laminates, N. mm^{-1}	ASTM D429 Method B	min. 7.0
Brittleness at - 40°C	ASTM D746 Procedure B	no failure
Low temperature crystallization increase in hardness, °Shore A	ASTM D2240	168 h at -25°C max. +15

341.3 SUBMITTALS

.1 Only bearings which comply with the Contract Documents and have previously been approved by the Engineer, in writing, shall be considered acceptable for supply.

.1 The Contractor shall submit in writing, a minimum of 30 Days in advance of the installation, the name of the pre-approved manufacturer supplying the bearings, the manufacturer's part number and the physical dimensions of the bearing to be supplied.

.2 The Contractor shall submit shop drawings for the bearings in accordance with Item 956 and the manufacturer shall provide the full data for the bearings including as a minimum the following:

.1 individual laminate and total bearing dimension,

.2 part numbers for bearings,

.3 maximum load capacity in compression,

.4 compression stiffness,

342.4.1 .6 Fasteners And Anchorage

.1 Fasteners, used to attach the bearing to the top and base plates, and anchorage devices shall be capable of resisting the greater of the lateral loads as specified or either of the following:

.1 For bearings with a capacity of 5000 kN or less at serviceability limit state Combination 1, 10% of the vertical load capacity.

.2 For bearings with capacity over 5000 kN at serviceability limit state Combination 1, 500 kN plus 5% of the vertical load capacity in excess of 5000 kN.

.2 The beneficial effect of friction shall be neglected in proportioning the fasteners and anchors.

342.4.1 .7 Replaceability

.1 The entire bearing assembly, except for the top plate used to attach it to the Superstructure and the base plate used to anchor it to the Substructure but including both contact surfaces of the sliding interface, shall be replaceable without damage to the Structure and without removal of any concrete, welds or anchorages permanently attached to the Structure and without lifting the Superstructure more than 5 mm.

.2 Bearings shall not be recessed into plates that are permanently attached to the Structure.

342.4.1 .8 Durability

.1 The bearings shall be fabricated from materials which are durable and are protected against corrosion so to perform their intended function.

.2 Bearings shall be designed to prevent moisture and dirt from entering the internal surfaces/.

342.4.1 .9 Concrete Bearing Pressure

.1 At serviceability limit state Combination 1 loads the average concrete bearing pressure shall not exceed 17 MPa.

.2 At ultimate limit states, the average concrete bearing pressure shall not exceed 24 MPa.

.3 The top and base plates of the bearing shall be proportioned to ensure that the permissible bearing pressures are not exceeded.

341.3.2 .5 maximum movement capacity in shear,

.6 installation details;

.7 load capacity at serviceability limit states Combination 1, including:

.1 maximum compressive permanent and total loads;

.2 compressive stiffness; and

.3 shear stiffness;

.8 number of steel plates in each bearing,

.9 rotational capacity of each bearing under maximum and minimum load, and

.10 material properties of the bearing components and test procedures employed to determine the properties.

.3 The Contractor shall submit to the Engineer, in advance of the installation, the manufacturer's certification, as a written affidavit, that the materials supplied meet the specified requirements as detailed in the Contract Documents.

.4 All bearings being supplied for the Work shall be approved in writing by the Engineer prior to the placement of the bearing into the structure.

341.4 CONSTRUCTION

341.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

341.4 .2 Fabrication

.1 The fabrication of the steel laminated bearings shall conform to CAN/CSA S6.

.2 Where pintles are specified, the depth of the pintle holes shall be such as to fully engage only one steel plate.

.3 Each laminated bearing shall be marked with the date of manufacture and an individual alphanumeric identification. The latter shall consist of the designated identification letter of the supplier and source followed by the letter "I" for polyisoprene and a sequential five digit number.

.1 The characters shall be not less than 10 mm high, stamped or engraved into two adjacent sides, with the indentations or protrusions not less than 1 mm in width and 1 mm in depth.

341.4.2 .4 The tolerances shall be as indicated in Table 341-2.

Table 341-2
Bearing Tolerances

Bearing thickness		
	≤ 40 mm	-0 mm to +3 mm
	> 40 mm	-0 mm to +6 mm
Bearing plan dimension		-0 mm to +6 mm
Thickness of individual layers of elastomer		± 20%
Deviation from plane parallel to theoretical surface		
	Top	1 in 200
	Sides	1 in 100
	Steel Laminates	0.25 T_e (Note 1)
Cover to embedded steel		±2 mm
Pintle hole diameter		-0 mm to + 2 mm
Relative position of pintle holes to each other		± 2 mm

Note 1: The tolerance of steel laminates shall be determined as follows:
(a) The distance from the base of the bearing to the bottom of every plate shall be measured. Measurements shall be taken at each corner of rectangular bearings and at the extremities of two perpendicular diameters of circular bearings.
(b) The difference between the highest and lowest measurements for every plate shall be recorded.
(c) The cumulative total of the differences recorded, expressed as a fraction of the effective rubber thickness of the bearing, shall be recorded.

341.4 .3 Installation

.1 The Contractor shall place bearings accurately with respect to the location and elevation, on level and smooth bearing surfaces, as indicated in the Contract Documents.

.2 Bearing block elevations shall be adjusted when bearing thickness varies from the reference bearing thickness shown in the Contract Documents.

.3 The tolerances shall be as indicated in Table 341-3.

Table 341-3
Tolerance For Top Of Bearing Elevations

Structure Type	Top Of Bearing Elevation
Concrete Structures	± 2.5 mm
Steel Structures	+ 3 mm
Box Girders	+ 2 mm
Deviation from level	± 0.1°

341.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of steel laminated bearings supplied and installed in accordance with this Item.

341.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

.2 The Owner will make partial payment for steel laminated bearings in accordance with 908.7.

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342.5 MEASUREMENT FOR PAYMENT 342-16

342.6 BASIS OF PAYMENT 342-16

342.1 DESCRIPTION

.1 This Item consists of the fabrication, supply and installation of all confined elastomer (pot) Bridge bearings required in the Contract.

342.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Bearings shall possess the minimum horizontal and vertical load capacity, and shall be constructed for the movement capacities, as indicated in the Contract Documents.

  .1 The rotational bearings and sliding surfaces shall consist of components arranged so as to transmit all loads (including uplift) and accommodate the rotations and, where necessary, translations of the Structure.

  .2 At serviceability limit state, the design shall be such that the bearings will not suffer damage which would affect their performance.

  .3 At ultimate limit states, the strength and stability of the bearings shall be adequate to resist the factored loads and accommodate movements of the Structure.

.3 Bearing material and workmanship shall comply with CAN/CSA S6.

.4 The allowable bearing pressures on the confined elastomer and bonded confined polytetrafluoroethylene polymer (TFE) elements are to be as stipulated in clause 11 of CAN/CSA S6.

.5 Steel components of the bearings (other than stainless steel sliding surfaces) shall Conform to the requirements of CAN/CSA G40.21M, Grade 350A.

.6 Stainless steel for sliding surfaces shall have a minimum corrosion resistance Conforming to ASTM A167 Type 304.

.7 Steel fasteners shall Conform to ASTM A325 and shall be galvanized to Conform to CAN/CSA G164.

  .1 For centre guide bars alternative steel fasteners may be approved.

.8 Brass sealing rings for confined elastomer bearings shall Conform to ASTM B36 Half-hard.

.9 Polyisoprene (natural rubber) shall Conform to 341.2 except that the hardness may be 50 ± 5.

.10 TFE resin for use in sliding surfaces shall be virgin material and shall Conform to ASTM D1457.

  .1 It shall be unfilled and Conform to the physical requirements indicated in Table 342-1.

Table 342-1
Physical Requirements for TFE Resin

Physical Property	ASTM Test Method	Requirement
Tensile Strength, MPa	D 638	minimum 20
Elongation, %	D 638	minimum 200
Relative Density	D 792	2.16 ± 0.03

342.2 .11 Material used as mating surface for guides for lateral restraint may be:

.1 unfilled TFE,

.2 TFE filled with up to 25% by mass of glass fibres; or

.3 lead filled TFE in a bronze matrix.

.12 Lubricant shall be silicone grease and shall Conform to OPSS 1203.05.06.

.13 Adhesives for bonding TFE to metal shall produce a bond with a minimum peel strength of 4 N/mm width when tested in accordance with ASTM D429 Method B and shall not degrade in the service environment.

.14 All steel bearing components, other then the stainless steel sliding surfaces, shall be painted with a primer coat of inorganic zinc silicate paint with a dry film thickness of 75 microns (-10 microns or +15 microns) of Carbo Zinc 11, manufactured by Corrosion Service Company Limited, or approved equivalent in accordance with 335.2 and 335.4.

.15 All surfaces, with the exception of the faying surface between the top of the top plate and the underside of the tapered shoe plate attached to the bottom flange of the girders (supplied under Item 335), shall be top coated with two coats of high build, modified aluminum epoxy mastic paint (Carbomastic 15) in accordance with 335.2 and 335.4.

.1 Each of these top coats shall have a film thickness of 125 microns ± 20 microns.

.16 The organic zinc primer shall be applied to a surface that is blast cleaned to Conform to "The Steel Structures Painting Council" specification SSPC-SP10 - No. 10 "Near White Blast Cleaning".

.17 All surface preparation and painting shall Conform to 335.2 and 335.4.

.18 The bolts for attaching the bearing top plate to the girder shoe plate shall be A325-Type I galvanized.

.19 At full design load, the maximum rotation and/or the eccentricity of the axial load shall not exceed 3% of the diameter of the elastomeric disc.

342.2 .20 Grout shall be In-Pakt Nonshrink Premix Grout or approved equivalent and shall have a minimum 28-day strength of 40 MPa.

.21 The entire bearing assembly, except for the top plate used to attach it to the Superstructure and the base plate used to anchor it to the Substructure but including both contact surfaces of the sliding interface, shall be replaceable without damage to the Structure and without removal of the concrete, welds or anchorages permanently attached to the Structure and without lifting the Superstructure more than 5 mm.

  .1 Bearings shall not be recessed into plates that are permanently attached to the Structure.

.22 Bearings shall be stored at least 100 mm of the ground in a weatherproof enclosure.

342.3 SUBMITTALS

342.3 .1 General

.1 The Contractor shall submit the design for the bearings, designed for the specified translation and load capacities, in accordance with Item 956.

  .1 Notwithstanding the requirements in 342.3.1.1, the submission shall include but not be limited to:

    .1 bearing layout and orientation;

    .2 the top and bottom plate details including anchorages;

    .3 installation details;

    .4 method of attachment of bearings to the top and bottom plates;

    .5 load capacity at serviceability limit states Combination 1, including:

      .1 maximum vertical permanent and total load;

      .2 maximum lateral load and corresponding vertical load; and

      .3 maximum rotational capacity about any horizontal axis and about the vertical axis through the centre of the bearing,

    .6 the bearing ID letter and numbers.

  .2 The Contractor shall have a stamped copy of these drawings at the site before and during site installation.

.2 Upon request, the Contractor shall submit certification that the fabrication is being performed by a recognized bearing manufacturers having experience in the manufacture of "pot" bearings.

342.3.1 .3 The Contractor shall submit to the Engineer a copy of the manufacturer's recommended procedures for handling, storing and installation of the bearings.

.4 The Contractor shall submit the manufacturer's signed written guarantee for the bearings, guaranteeing as a minimum:

  .1 Each bearing is to perform satisfactorily, in the opinion of the designer/manufacturer, for a period of five years after the Bridge has been opened to regular vehicular traffic.

  .2 If, during the five year guarantee period, the bearings do not perform satisfactorily, the manufacturer of the bearings shall replace the bearings.

    .1 All costs related to repairs, replacements, jacking of the Bridge, installation and any other Work necessary to complete the Work of replacing the bearings shall be incidental to this guarantee and shall be borne by the manufacturer of the bearings.

    .2 All required repairs shall be carried out in accordance with this Item and shall be approved by the Engineer.

.5 All grouting procedures shall be submitted for approval prior to commencement of the Work.

.6 Submittals are required in accordance with any cross referenced Item forming part of this Item.

342.3 .2 Approval of Supplier

.1 The Engineer may request for the supplier to be approved, in which case the supplier may be required to submit the following data for each class and type of bearing:

  .1 Typical drawings showing all materials, tolerances, details of construction including uplift restraint devices, if applicable, and methods of installation.

  .2 Load range (minimum and maximum).

  .3 Maximum rotational capacity about any horizontal axis and the vertical axis through the centre of the bearing.

  .4 Maximum translational capacity.

  .5 Lateral Load capacity of rotational bearings.

  .6 Capacity of lateral restraints of translational elements.

  .7 Corrosion protection.

  .8 A TFE sample of at least 200 mm in diameter.

342.3.2.1 .9 A typical sample of elastomeric disc.

.10 A sample of the smallest production size unidirectional bearing with a translational capacity of at least ± 50 mm, the shop drawings and the design calculations for the bearing.

.11 The design calculations shall be stamped and signed by a Professional Engineer registered or licensed to practice in the Province of New Brunswick

.12 Final approval of the source of supply shall be based on compliance of the sample bearing, and the shop drawings with the specified requirements noted in the Contract Documents.

  .1 Any deviation from the materials and details indicated on the typical drawings and the typical sample shall be cause for cancellation of approval and necessitate application for approval.

342.4 CONSTRUCTION

342.4 .1 Design Requirements

342.4.1 .1 General

.1 The bearings shall be proportioned to function satisfactorily under the critical combinations of the maximum and minimum factored loads and the factored translations and rotations at the serviceability limit state and the ultimate limit states as shown on the Contract Documents.

.2 Bearings subject to uplift shall limit the separation of the bearing components to the value specified.

.3 All steel components of the bearings, including fasteners, shall be proportioned in Conformance with the requirements of CAN/CSA S6.

.4 The average stress in the elastomer at serviceability limit state Combination 1 loads shall Conform to the requirements of 342.2.4.

342.4.1 .2 Translation Rotation

.1 Provision for translation shall be through sliding of a stainless steel surface against a mating TFE element.

.2 The translational capacity in the unrestrained direction of directions shall be as specified, or ±50 mm, whichever is greater.

342.4.1.2 .3 Translational elements with lateral restraints shall be capable of resisting the greater of the lateral loads as specified or either of the following:

  .1 For bearings with a capacity of 5000 kN or less at serviceability limit state Combination 1, 10% of the vertical load capacity.

  .2 For bearings with a capacity over 5000 kN plus 5% of the vertical load in excess of 5000 kN.

.4 Provision for rotation about any horizontal axis shall be by means of a single disc of confined elastomer for pot bearings.

.5 The rotational capacity about the vertical axis through the centre of the bearing shall be as specified or ± 1°, whichever is greater.

.6 Uplift restraint devices shall not restrict rotations.

.7 At serviceability limit state Combination 1 loads and maximum rotation, the shift in the axial load from the centre of bearing shall not exceed the following values:

  .1 3% of the diameter of the confined elastomer for pot bearings;

.8 Rotational bearings shall be capable of resisting, in any direction, the lateral loads as specific in combination with the applicable vertical loads.

.9 The rotation of confined elastomeric bearings about a horizontal axis shall be limited so that the vertical strain at the perimeter of the elastomer, at serviceability limit state Combination 1 loads does not exceed 0.15 of the elastomer thickness.

.10 Brass sealing rings at least 6 mm wide shall be provided at the perimeter of the elastomer to prevent the elastomer from extruding between the piston and the pot wall.

.11 A minimum of two layers of flat sealing rings shall be used with the split ends equally positioned around the circumference of the elastomer and shall fit snugly against the surface of the inside perimeter of the pot wall.

.12 The sealing rings shall be flat and smooth on all surfaces.

.13 The upper edge of the elastomer shall be recessed to accommodate the sealing rings.

.14 The depth of the pot wall shall be such that a minimum vertical distance of 2.5 mm remains between the top of the pot wall and the closest point of contact of the sealing rings with the pot wall upon rotating the piston and amount equal to the required rotation plus 1°.

.15 The pot and piston surfaces in contact with the confined elastomer shall be lubricated with silicone grease.

342.4.1.2 .16 The bearing shall be sealed by a one piece continuous performed closed-cell compressible ring against entry of dirt, Dust and moisture between the elastomer and the pot and piston contact surfaces.

.17 Any joint in the ring shall be bonded and the strength shall be at least equal to the strength of the ring.

342.4.1 .3 Sliding Surfaces

342.4.1.3 .1 General

.1 Sliding surfaces shall allow translation or rotation by sliding of a metal surface against a mating TFE element.

.1 For plane surfaces, the metal surface shall be stainless steel; and for spherical surfaces, the metal surface shall be stainless steel or anodized aluminum alloy.

.2 The metal surface shall overlap the TFE by at least 5 mm at extremes of movement and except for guides for lateral restraint, shall be positioned above the TFE element so that the sliding movements will cause the accumulations of Dust and dirt to fall off.

342.4.1.3 .2 TFE Element

.1 Except when used as mating surfaces for guides for lateral restraint, the TFE resin shall be virgin material and shall be used as unfilled sheets and shall contain spherical reservoirs for lubricant pressed into its surface.

.2 The diameter of the reservoirs shall not exceed 8 mm, measured at the surface of the TFE, and the depth shall not be less than 2 mm nor more than half the thickness of the TFE.

.3 The reservoirs shall be evenly distributed across the surface of the TFE and shall occupy not less than 20% nor more than 30% of the surface.

.4 Material used as mating surface for guides for lateral restraint shall Conform to 342.2.12 and 342.2.13 and shall not be dimpled or lubricated.

342.4.1.3 .3 Stainless Steel

.1 The thickness of the stainless steel sheet shall not be less than that given in Table 342-2 for dimensional differences between stainless steel and the TFE in the direction of movement.

Table 342-2
Thickness Of Stainless Steel

Dimensional Difference between Stainless Steel and TFE mm	Minimum Thickness of Stainless Steel mm
≤ 300	1.5
> 300 and ≤ 500	2.0
> 500 and ≥ 1500	3.0

342.4.1.3 .4 Lubrication

.1 All TFE surfaces except those which act as mating surfaces for guides or are subject to a contact pressure of less than 5 MPa, shall be permanently lubricated with silicone grease.

342.4.1.3 .5 Thickness of TFE and Depth of Recess

.1 The TFE element shall be fully bonded in the manufacturer's plant and recessed in a rigid backing material.

.2 Thickness of the TFE element and the depth of recess shall be as given in Table 342-3.

Table 342-3
Thickness of TFE Elements and Depth of Recess

Maximum Plan Dimension, mm	≤ 1200	> 1200
Thickness, mm	5.0	5.5
Depth of Recess, mm	2.5	3.0

342.4.1.3 .6 Contact Pressure

.1 The average contact pressure for unfilled TFE elements based on the gross area of the TFE, shall not exceed the values given in Table 342-4.

Table 342-4
Average Contact Pressure For TFE Elements

Limit State	Dead Load MPa	Total Load MPa
Serviceability - Combination 1	30	45
Ultimate	45	70

342.4.1.9 .4 The effective area for distributing the bearing load shall be taken as the contact area of the elastomer or TFE transferring the load to the plate plus the area within the uninterrupted dispersal lines drawn at 45° to the line of application of the load from the contact area.

342.4 .2 Fabrication

342.4.2 .1 Welding

.1 Welding of structural quality steels shall Conform to 335.4.

.2 Welding of stainless steel shall be done with appropriate electrodes Conforming to CAN/CSA W48.2 or AWS A5.22.

.3 The welding procedure shall be approved by the Canadian Welding Bureau.

.4 The stainless steel sheets which will be in contact with TFE shall be one piece continuously welded around the perimeter to its backing plate to prevent ingress of moisture.

.5 The weld shall be clean, uniform and without overlaps and shall be located outside the area in contact with TFE.

342.4.2 .2 Fasteners

.1 The threaded portion of the bolts shall be coated with silicone grease prior to installation.

342.4.2 .3 Anchors

.1 When the Contract Documents specify that bearings shall be supplied from a listed source, the top and base plate anchorage to concrete may be provided by studs, using the fusion welding process, unless otherwise indicated in the Contract Documents.

  .1 The anchorage for steel structures shall be provided with bolts and anchor bolts as indicated on Standard Drawing 342-1 and in the Contract Documents.

.2 Alternative methods of anchoring these plates may be approved.

342.4.2 .4 Machining

.1 Machining shall be carried out after welding wherever possible.

.2 Metal to metal contact surfaces shall be machined or fine ground.

.3 The pots and pistons for confined elastomer bearings shall be machined from solid metal plate or castings.

342.4.2.4 .4 There shall be no openings or discontinuities in the metal surfaces in contact with the elastomer or TFE.

342.4.2 .5 Roughness Of Metal Surface

.1 The roughness of metal surface in contact with TFE, measured to Conform to CAN/CSA B95, shall not be greater than 0.25 μm arithmetic average for plane surfaces.

.2 The roughness of metal surfaces in contact with elastomers measured to Conform to CAN/CSA B95, shall not be greater than 3.0 μm arithmetic average.

342.4.2 .6 Attachment of TFE

.1 Virgin of glass filled TFE elements shall be recessed in a rigid backing material and shall be bonded over the entire area with an adhesive.

.2 The rigid backing material shall be grit blasted prior to applying the adhesive.

.3 Lead filled TFE shall be mechanically fastened, and bonded to the backing plates.

342.4.2 .7 Corrosion Protection

.1 All exposed metal surfaces except stainless steel, and components permanently attached to steel Superstructures shall be protected against corrosion by an inorganic/aluminum epoxy mastic system Conforming to 335.2 and 335.4.

.2 Steel fasteners shall be galvanized or protected by other approved methods.

.3 For corrosion protection purposes, bearing components permanently attached to steel Superstructures shall be considered part of the structural steel.

342.4.2 .8 Identification

.1 The bearings shall be supplied with each bearing marked with the date of manufacture and an individual alphanumeric identification.

.2 The latter shall consist of the designated identification letter of the supplier and source followed by a sequential five digit number.

.3 The characters shall be stamped or engraved into two adjacent sides and shall be clearly legible after installation.

.4 The characters shall not be less than 10 mm high with the indentations not less than 1 mm in width and 0.5 mm in depth.

342.4.2 .9 Tolerances

342.4.2.9 .1 General

.1 The deviation from flatness of stainless steel or aluminum alloy surfaces in contact with TFE for plane surfaces and from the theoretical surface for spherical surfaces shall not exceed 0.0003 LH mm for rectangular bearing nor 0.0006 RH mm for circular TFE elements, where L is the greater plan dimension for a rectangular bearing, R is the radius of a circular bearing and H is the free height of TFE element.

.2 For confined elastomer bearings, the tolerance of fit between the piston and the pot shall be +0.75 mm to +1.25 mm.

.3 The inside diameter of the pot cylinder shall be the same as the nominal diameter of the elastomer and shall be machined to a tolerance of -0, +0.125 mm for diameters up to and including 500 mm and -0, +0.175 mm for diameters over 500 mm.

.4 The plan dimensions of the recess for the TFE shall be the same as the nominal plan dimensions of the TFE and shall be machined to a tolerance of 0, +0.2% of diameter or diagonal.

.5 Overall bearing plan dimension ± 3m.

.6 Overall bearing height ± 3 mm.

.7 Machined surfaces except where otherwise specified ±0.4 mm.

342.4.2.9 .2 Elastomer

.1 Diameter +0.0 / -1.5 mm for diameters ≤ 500 mm
+0.0 / -2.0 mm for diameters > 500 mm

.2 Thickness -0.0 / +1.0 mm

.3 Brass rings

  .1 Difference between internal diameter of brass ring and diameter of recess in the moulded elastomer shall be -0 / + 0.5 mm.

  .2 Difference between sum of thickness of brass rings and recess depth in the moulded elastomer shall be -0 / + 0.25 mm.

.4 Recessed Guide Bars - American Standard Clearance Locational Fit Class LC3.

.5 Guides for Lateral - Gap between metal surfaces Restraints and mating TFE elements shall be 0.50 mm ± 0.25 mm.

.6 TFE plan dimension + 0 / - 0.2% of diameter or diagonal

342.4.2.9.2 .7 TFE thickness - 0 / + 10.0% of thickness

.8 Depth of recess for TFE - 0 / + 0.3 mm

342.4 .3 Installation

342.4.3 .1 General

.1 The Contractor shall carry out the Work at the locations as indicated in the Contract Documents.

.2 The Contractor shall ensure that all materials, workmanship, construction and inspection shall Conform to the requirements of 335.2 and 335.4, except as further modified and expanded upon by this Item and/or submission under 342.3.1.1.

.3 All steel plates shall be pressed or machined flat prior to manufacture of the bearings.

.4 The bottom portion of the bearing (the pot), which contains the elastomer, shall be machined from a solid piece of steel.

.5 Tabs for bolting the pot to the masonry plate shall be machined from the same plate as the pot.

.1 Welding of the tabs for attachment of the tabs to the pot will not be permitted.

.6 Structural steel components of the bearings shall have a minimum dimension in any direction of 25 mm.

.7 The Contractor shall ensure that all bearings shall be installed in the Bridge under the direct supervision of a Qualified Technical Representative of the bearing manufacturer.

.8 The bearings shall be shipped and stored in accordance with the manufacturers recommendations.

.1 As a minimum the bearings shall be stored at the site in weatherproof shelters and kept out of direct sunlight.

342.4.3 .2 Grouting of Bearings

.1 Prior to the grouting, the bearing base plates shall be carefully levelled within a tolerance of 1 in 200 and locked by means of the levelling and top nuts provided on the anchor bolts.

.1 All concrete surfaces to be grouted are to be roughened to an amplitude of ±5 mm and all dirt, rust, oil, grease, and other such contaminants are to be removed from the grout area prior to the commencement of grouting.

342.4.3.2 .2 The annular space between the anchor bolts and sleeves shall be grouted with grout of flowable consistency mixed and placed in accordance with the manufacturer's instruction.

.3 The space between the bearing base plates and top of concrete shall be filled with the "dry pack" grout mixed in accordance with the manufacturer's instructions.

  .1 Following dry packing, the grout shall be covered for four Days with wet burlap.

  .2 Grout shall be maintained at a temperature of at least 10°C during the curing period.

    .1 No grouting shall be done when the concrete or steel is below freezing.

.4 Superstructure components shall not be placed on the bearings until the grout has obtained a minimum strength of 80% of the specified 28-day strength.

342.5 MEASUREMENT FOR PAYMENT

.1 The fabrication, supply and installation of all confined elastomer (pot) Bridge bearings in accordance with this Item shall be on a lump sum basis.

342.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

.2 The Owner will make partial payment for confined elastomer (pot) Bridge bearings in accordance with 908.7.

SEALED EXPANSION JOINT ASSEMBLIES — ITEM: 343

343.1 DESCRIPTION

.1 This Item consists of the supply and installation of sealed expansion joint assemblies including modular assemblies.

343.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 The approved expansion joint assemblies to be supplied shall be as noted in the Contract Documents.

.3 Cast-in-place type anchors or inserts, steel cover plates and cap screws shall be supplied with the expansion joint assemblies.

.4 All steel surfaces, with the exception of anchor studs, shall be sandblasted to a white metal finish and coated with an approved inorganic zinc coating conforming to CGSB 1-GP-171B Type 1 (100 μm ± 12 μm thick) or zinc metalized in accordance with CAN/CSA G189 (125 μm thick).

.5 The support boxes for the sliding plates in modular expansion joints shall be designed such that the bottom plate transfers the load to the side plates, assuming no support from the thin layer of concrete beneath the support boxes.

.6 All centre beams (separation beams) and edge beams shall be solid or voided steel extrusions or machined shapes and shall not be built-up welded members.

.7 The design loading for sealed expansion joint assemblies and for centre beams shall be CL-625-ONT plus the dynamic load allowance, and all stresses shall be within the limits specified in CAN/CSA S6.

.8 The round bar anchorages and cover plates shall conform to CAN/CSA G40.21 - Grade 260 W.

.9 All steel used for extrusions, edge beams and support bars shall conform to the minimum requirements of CAN/CSA G40.21 - Grade 350A or ASTM A588, unless grades of higher yield strength are required to satisfy the stresses resulting from the loading specified.

  .1 All other steel components shall conform to the minimum requirements of CAN/CSA G40.21 - Grade 300 W.

.10 Welded anchor studs, when required, shall be the size indicated in the Contract Documents and shall be made from steel meeting the requirements of ASTM A-108.

.11 Cover plates are to be galvanized by hot dipping in accordance with CAN/CSA G-164, to a minimum thickness of 175 μm and/or a minimum application of 1 kg/m^2.

.12 Anchors for cover plates shall be Richmond Insert Type LFW (closed ferrule) or approved equivalent, a minimum of 70 mm long sized for 13 mm diameter x 32 mm long threaded cap screws with Allen socket head or approved equivalent.

343.2.13 Sealed expansion joint assemblies shall be stored at least 150 mm off the ground in a manner to maintain the cross slope and avoid permanent distortion.

343.3 SUBMITTALS

.1 The Contractor shall submit the shop drawings for the sealed expansion joint assembly in accordance with Item 956.

.2 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.

  .1 All welders shall be certified by the CWB to CAN/CSA W47.1 specifications, and/or to a certification level of Qualified Welder as issued by the Province of New Brunswick.

343.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 A representative from the expansion joint assembly(s) manufacturer or supplier shall be present when modular expansion joints are installed.

  .1 All materials, anchor bolt spacing and the recesses formed to receive the assemblies shall meet the representative's approval before the Contractor may place the assemblies.

.3 The inserts for attaching the steel cover plates at curb(s), Sidewalk(s) and/or barrier wall(s), are to be cast in the concrete and the steel plates are to be fastened for final installation after the concrete has attained a minimum 24 hour set.

.4 All welding shall conform to the requirements of CAN/CSA W59.

.5 Cover plates are to be anchored on the approaching traffic side of the joint.

.6 The steel portions of the expansion joint assemblies shall be fabricated in one piece in the fabricating shop, unless otherwise specified.

.7 Portions of inorganic zinc coating, damaged in the field, shall be mechanically cleaned and recoated in the field.

.8 Spacing hardware shall be released within 2 hours maximum of the placing of the adjacent concrete.

.9 The steel portions of the expansion joint assemblies shall be fabricated to the dimensions indicated in the Contract Documents and are subject to the tolerances indicated in Table 343-1.

Table 343-1
Expansion Joint Fabrication Tolerances

Dimensions	Face of curb to back of curb	± 6 mm
	Face to face of curbs	± 6 mm

Crown		± 1 mm in 1 m

343.4 .10 The expansion joint assemblies shall be installed in the position indicated in the Contract Documents and are subject to the tolerances indicated in Table 343-2.

Table 343-2
Expansion Joint Installation Tolerances

Elevation	- 3 mm
This tolerance shall not be considered additive with the tolerances presented in Table 343-1	

Joint Opening	± 3 mm

343.5 MEASUREMENT FOR PAYMENT

.1 The supply and installation of the complete sealed expansion joint assemblies in accordance with this Item shall be on a lump sum basis.

343.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price for each type of sealed expansion joint assembly, as identified under the Contract.

.2 The Owner will make partial payment for sealed expansion joint assemblies in accordance with 908.7.

344.1 DESCRIPTION

.1 This Item consists of the supply and installation of steel finger joint assemblies.

344.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 All steel surfaces, with the exception of anchor studs, shall be sandblasted to a white metal finish and coated with an approved inorganic zinc coating conforming to CGSB 1-GP-171B Type 1 (100 μm ± 12 μm thick) or zinc metalized in accordance with CAN/CSA G189 (125 μm thick).

  .1 Sandblasting shall not be used on stainless steel.

.3 The round bar anchorages and cover plates shall conform to CAN/CSA G40.21 - Grade 260 W.

.4 Welded anchor studs, when required, shall be the size indicated in the Contract Documents and shall be made from steel meeting the requirements of ASTM A-108.

.5 Cover plates are to be galvanized by hot dipping in accordance with CAN/CSA G-164, to a minimum thickness of 100 μm and/or a minimum application of 1 kg/m^2.

.6 Anchors for cover plates shall be Richmond Insert Type LFW (closed ferrule) or approved equivalent, a minimum of 75 mm long sized for 13 mm diameter x 50 mm long threaded cap screws with Allen socket head.

.7 Structural steel in finger plate assemblies shall meet the requirements of CAN/CSA G40.21M Grade 350AT Category 3 or with a certified Charpy V-notch impact energy of 27 joules when tested at minus 20 °C.

.8 Stainless steel shall conform to the requirements of ASTM A240 :AISI Type 316.

.9 Steel finger joint assemblies shall be stored at least 150 mm off the ground in a manner to maintain the cross slope and avoid permanent distortion.

344.3 SUBMITTALS

.1 The Contractor shall submit the shop drawings for the finger joint assemblies in accordance with Item 956.

.2 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.

  .1 All welders shall be certified by the CWB to CAN/CSA W47.2 specifications, and/or to a certification level of Qualified Welder as issued by the Province of New Brunswick.

344.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The inserts for attaching the steel cover plates at curb(s), Sidewalk(s) and/or barrier wall(s), are to be cast in the concrete and the steel plates are to be fastened for final installation after the concrete has attained a minimum 24 hour set.

.3 All welding shall conform to the requirements of CAN/CSA W59.

.4 Cover plates are to be anchored on the approaching traffic side of the joint.

.5 The steel trough shall be sealed to the finger joint assembly to construct a durable watertight joint.

.6 Steel finger joint assemblies shall be fabricated in one piece in the fabricating shop, unless otherwise specified.

  .1 All expansion joint assemblies field welded shall be ground flush.

  .2 Portions of inorganic zinc coating, damaged by field welding, shall be mechanically cleaned and recoated in the field.

  .3 Inorganic zinc shall have all curing solution and residue removed by water and bristle brush, prior to installation of assemblies.

  .4 Stud anchors on steel expansion joint assemblies shall conform to the requirements of CAN/CSA W59.

.7 Steel finger joint assemblies shall be fabricated to the dimensions indicated in the Contract Documents and are subject to the tolerances indicated in Table 344-1.

Table 344-1
Finger Joint Fabrication Tolerances

Dimensions	Face of curb to back of curb	± 6 mm
	Face to face of curbs	± 6 mm

Crown		± 1 mm in 1 m

344.4 .8 Steel finger joint assemblies shall be installed in the position indicated in the Contract Documents and are subject to the tolerances indicated in Table 344-2.

Table 344-2
Finger Joint Installation Tolerances

Elevation	- 3 mm
This tolerance shall not be considered additive with the tolerances presented in Table 344-1	

Joint Opening	± 3 mm

344.5 MEASUREMENT FOR PAYMENT

.1 The supply and installation of the complete steel finger joint assemblies in accordance with this Item shall be on a lump sum basis.

344.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

.2 The Owner will make partial payment for steel finger joint assemblies in accordance with 908.7.

STEEL BALLASTWALL ANGLE **ITEM: 345**

345.1 DESCRIPTION

.1 This Item consists of the supply and installation of the steel angle on the top of each abutment ballastwall.

345.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 All steel surfaces, with the exception of anchor studs, shall be sandblasted to a white metal finish and coated with an approved inorganic zinc coating conforming to CGSB 1-GP-171B Type 1 (100 μm ± 12 μm thick) or zinc metalized in accordance with CAN/CSA G189 (125 μm thick).

.3 The round bar anchorages and cover plates shall conform to CAN/CSA G40.21 - Grade 260 W.

.4 Welded anchor studs, when required, shall be the size indicated in the Contract Documents and shall be made from steel meeting the requirements of ASTM A108.

.5 Structural steel in the ballastwall angle shall meet the requirements of CAN/CSA G40.21M-300W.

.6 Steel ballastwall angle shall be stored at least 100 mm off the ground in a manner to maintain the cross slope and avoid permanent distortion.

345.3 SUBMITTALS

.1 The Contractor shall submit the shop drawings for the steel ballastwall angle in accordance with Item 956.

.2 The Contractor shall submit proof of certification for the welders conducting the Work, prior to commencing the Work.

  .1 All welders shall be certified by the CWB to CAN/CSA W47.1 specifications, and/or to a certification level of Qualified Welder as issued by the Province of New Brunswick.

345.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All welding shall conform to the requirements of CAN/CSA W59.

.3 Steel ballastwall assemblies shall be fabricated in one piece in the fabricating shop, unless otherwise specified.

345.4.3 .1 Portions of inorganic zinc coating, damaged by field welding, shall be mechanically cleaned and recoated in the field.

.2 Inorganic zinc shall have all curing solution and residue removed by water and bristle brush, prior to installation of assemblies.

.3 Stud anchors on steel ballastwall assemblies shall conform to the requirements of CAN/CSA W59.

345.4 .4 Ballastwall assemblies shall be fabricated to the dimensions and installed in the position indicated in the Contract Documents and Standard Drawing 345-1.

345.5 MEASUREMENT FOR PAYMENT

.1 The supply and installation of the complete steel ballastwall angle assemblies in accordance with this Item shall be on a lump sum basis.

345.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

.2 The Owner will make partial payment for steel ballastwall angle assemblies in accordance with 908.7.

346.1 DESCRIPTION

.1 This Item consists of the supply and installation of an aluminum guide rail system on a Highway Structure.

346.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

346.3 SUBMITTALS

.1 The Contractor shall submit shop drawings for the aluminium guide rail system in accordance with Item 956.

346.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall be responsible for the placing and alignment of the anchor bolts in the formwork and concrete at the stage of the Work when this placement must occur.

.3 The Contractor shall install all posts and railing(s) and these shall be secured firmly in place.

.4 All contacting aluminum and concrete surfaces shall be separated by a fabric pad.

.5 Aluminum posts shall be separated from steel bolts by nylon or plastic bushings.

.6 Rail posts bases bearing unevenly on concrete surfaces shall be brought to bear in alignment as specified by grouting under the base plate of the rail post with an approved epoxy grout.

  .1 The grout shall provide a smooth bearing surface under the full base plate area and shall form a waterproof seal.

346.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of aluminum guide rail system on a Highway Structure supplied and installed in accordance with this Item.

.2 The measured Quantity shall be the direct straight line measurement along the centerline of the guide rail system, measured from end cap to end cap of each section and on both sides of the Structure.

346.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of aluminum guide rail system on a Highway Structure, as identified under the Contract.

348.1 DESCRIPTION

.1 This Item consists of the supply and installation of all service ducts in Structures.

348.2 MATERIALS

348.2 .1 General

.1 All materials shall be supplied by the Contractor.

348.2 .2 Fibreglass Duct

.1 Fibreglass duct, couplings, bends and end caps shall be made of fibreglass reinforced epoxy (FRE) and shall conform to CAN/CSA C22.2.

348.2 .3 Polyvinyl Chloride Duct

.1 All PVC duct, bends, couplings and caps shall conform to Bell Canada's Specifications - "Semi-Rigid Plastic Duct" - CT20-286 and shall be Type II (Thick Wall).

.2 Each section of PVC duct shall have the following information printed on the duct surface and at intervals not exceeding 1.5 m:

  .1 Manufacturer's name and trademark,

  .2 Inside diameter in millimetres, and

  .3 Type designation.

348.2 .4 Steel Supports

.1 Steel in supports and sleeves shall conform to CAN/CSA G40.21-300.

.2 All steelworks shall be galvanized in accordance with CAN/CSA G-164.

348.2 .5 Fish Rope

.1 The fish rope shall be polypropylene not less than 5 mm in diameter and shall be one piece in each duct.

348.2 .6 Storage

.1 Materials are to be stored in an organized fashion at least 100 mm off the ground with individual pieces contained or strapped.

348.3 SUBMITTALS

.1 The Contractor shall submit to the Engineer, upon request, the manufacturer's certification that the materials meet or exceed the specified grade.

348.4 CONSTRUCTION

348.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall ensure that an inspection of the Work has been completed and the Work is accepted, in writing by the Engineer, prior to the placement of any concrete surrounding and encasing the Work.

348.4 .2 FRE Duct

.1 The duct shall be of the bell and spigot type with all joints fully seated together.

.2 The duct shall be tied with wire to the reinforcing steel at intervals not exceeding 1.5 m.

.3 Where external supporting steelworks is detailed in the Contract Documents, the Contractor shall supply and install this Structure at the stage of the Contract most beneficial to complete the Work.

.4 A minimum of 3 Days notice prior to placing concrete on the duct shall be given to the Engineer to allow inspection of the FRE service ducts.

.5 Expansion sleeves shall be provided at each expansion joint in the Bridge Superstructure and shall be of the type indicated in the Contract Documents.

348.4 .3 PVC Duct

.1 Joints shall be fitted with push-fit type couplings and the duct shall be fully seated into the coupling.

.2 The duct shall be tied with wire to the reinforcing steel at intervals not exceeding 1.5 m.

.3 Expansion sleeves shall be provided at each expansion joint in the Bridge Superstructure and shall be of the type as indicated on the Contract Documents.

.4 Each duct run shall be equipped with two (1 m) 45° bends in each abutment and shall be as shown in the Contract Documents or as directed by the Engineer.

.5 A 300 mm long galvanized steel pipe sleeve shall be provided on each PVC duct where it leaves the end of the abutment wingwalls or Sidewalks.

  .1 The galvanized steel sleeve shall be embedded 200 mm in the abutment wingwall or Sidewalk and shall extend 100 mm beyond the concrete surfaces.

  .2 The exposed 100 mm of the galvanized steel pipe sleeve shall be threaded on the outside.

348.4 .4 Testing

348.4.4 .1 General

.1 After the installation is complete, a mandrel with a diameter of at least 90% of the diameter of the installed duct and a minimum length of 250 mm, shall be passed through the length of the duct system in the presence of the Engineer.

.2 The Contractor shall be responsible to clear and/or replace any ducts that do not pass the mandrel test.

.2 After completion of testing, the Contractor shall thread each duct with a fish rope and terminate at each end in a "screw-eye" inserted in the recess provided in the duct cap.

.1 A surplus of approximately 1 m of fish rope shall be provided at each duct end.

.3 Caps shall be affixed to each end of the duct with an appropriate solvent welding cement to the galvanized steel pipe sleeves at the ends of abutment wingwalls or Sidewalks.

348.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of duct supplied and installed in accordance with this Item.

.2 The linear measurement shall be taken from end to end on each duct and shall be measured along the continuous direct run of the duct.

348.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of duct, as identified under the Contract.

.2 The Owner will make partial payment for duct in accordance with 908.7

351.1 DESCRIPTION

.1 This Item consists of the supply and installation of waterproofing systems on Structures.

351.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

  .1 The waterproofing system "A" shall be a manufactured waterproofing membrane system consisting of a primer, a membrane and a mastic and shall be used on the decks of Structures.

  .2 The waterproofing system "B" shall be a manufactured waterproofing membrane system consisting of a primer, a membrane, a mastic and a protection board and shall be used on the ballastwalls of Structures and on concrete box Culverts.

    .1 Protection board shall be Vibraflex Type 70 and/or IKO 1/8" Protecto Board or approved equivalent and having a maximum absorption of 3%.

  .3 The approved waterproofing system shall be selected from the list provided in the Contract Documents.

.2 Materials shall be stored at least 100 mm off the ground in a weatherproof enclosure.

351.3 SUBMITTALS

.1 The Contractor shall submit to the Engineer, 7 Days in advance of the commencement of the Work, the proposed type of waterproofing system including as follows:

  .1 The manufacturer's recommended procedures for installation and instructions for handling the waterproofing system and its components.

  .2 The manufacturer's specified minimum temperature for asphalt concrete during placement on the waterproofing system.

  .3 The Contractor shall select a product appropriate for the application and field conditions in accordance with the manufacturer's specifications.

  .4 The waterproofing and asphalt concrete shall perform as a waterproofing system.

351.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All concrete surfaces shall be dry and free of foreign materials prior to priming.

  .1 Any primed surfaces left overnight shall be re-primed prior to membrane application.

351.4 .3 The Contractor shall prepare the area and install the waterproofing system in accordance with the manufacturer's installation specifications and instructions.

.4 For all waterproofing applications the following shall apply:

- .1 The membrane shall be protected, when so noted in the Contract Documents, with the specified protection board, adhered to the waterproofed surface.
- .2 Any protection board which is to be left exposed for more than 48 hours shall be protected from sunlight exposure in accordance with the manufacturer's instructions.
- .3 All exposed edge terminations shall receive a trowelled bead of mastic.

.5 For Bridge decks, the edge details shall be constructed as shown on Standard Drawing 351-1.

- .1 Solvent based materials shall be cured for appropriate time period prior to the placing of the waterproofing membrane.

.6 For ballast walls the membrane shall be applied in vertical strips starting at the mid-depth of the downward angle of the ballast wall angle.

- .1 The membrane shall cover the entire back face of the ballast wall with a minimum 150 mm overlapping onto the approach slab and wingwalls.
- .2 The details for installation are shown on Standard Drawing 351-2.

.7 For concrete box Culverts, the following conditions shall apply:

- .1 The membrane shall be applied in strips perpendicular to the long axis of the Culvert.
- .2 The membrane shall cover the entire top surface of the Culvert and the upper 450 mm of the sides.
- .3 The protection board shall be applied over the top of the waterproofing system, on both the top and sides and adhered to the membrane by placing gobs of the mastic at 600 mm centres between the two surfaces.
- .4 The protection boards shall be butted tightly and shall be orientated vertically when coverage of the sides is specified and in all cases shall completely cover the applied waterproofing system.

.8 The Contractor shall pave a Bridge deck within 3 Days of the installation of the deck slab waterproofing.

351.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of waterproofing system supplied and installed in accordance with this Item.

  .1 Starter strips, flashing, overlapped joints, double plied areas, patches and seams shall be measured as a single layer of the waterproofing system.

351.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of waterproofing system, as identified under the Contract.

.2 The Owner will make partial payment for the waterproofing system in accordance with 908.7.

361.1 DESCRIPTION

.1 This Item consists of the design, supply, construction and removal of the materials necessary to shore excavations.

361.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Timber and lumber used in the construction of shoring shall be graded and stamped with the grade mark used by the Canadian Lumber Manufacturing Association and agencies authorized to mark lumber in Canada and/or lumber approved.

.3 Timber piles used in shoring shall meet the requirements of CAN/CSA 056.

.4 Steel sheeting shall be free from kinks and bends.

.5 Steel members with reduced cross-sectional areas due to holes, cuts, and other discontinuities differing from those shown in the design submission and/or in the Contract Documents which reduce the design capacity of the members shall not be used.

.6 When the grade of the steel members is not known and/or certified, the Engineer will assume that the yield point of the steel is 200 MPa.

361.3 SUBMITTALS

.1 The Contractor shall be responsible for the design of the, shoring and associated bracing and shall submit the design, in accordance with Item 956.

  .1 Shoring shall also be designed by the Contractor to meet the requirements of Section 21 of the Industrial Safety Code.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

361.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer and/or as may be required due to Work Site conditions as the Work progresses.

.2 The Contractor shall design and construct all shoring to withstand the anticipated design loadings.

.3 The Contractor shall be responsible for the adequacy of the shoring and the safety of the workmen and the Work Area, continuously from the time of placement of the shoring until such time as the shoring is removed.

361.4 .4 The Contractor shall remove the shoring and all materials shall remain the property of the Contractor and he shall dispose of them outside the Work Site.

361.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of shoring designed, constructed and removed in accordance with this Item.

.2 The area to be measured for payment shall be the extent of the shoring exposed from the base of the excavation to a point vertically upward 300 mm below the surrounding natural grade and horizontally along the edge of the base of the excavation.

361.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

365.1 DESCRIPTION

.1 This Item consists of the supply and placement of engineered fill.

365.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Engineered fill shall consist of clean hard sound durable crushed rock, crushed gravel or pit run gravel, composed of clean, uncoated particles, free of mud, mudstone, siltstone or other unconsolidated rock material, organic materials and other deleterious material, and when tested in accordance with ASTM C117 and/or C136, shall conform to the grading limits as indicated in Table 365-1.

Table 365-1
Engineered Fill Gradation Limits

ASTM Sieve Size	Percent Passing
37.5 mm	100
31.5 mm	95 - 100
19.0 mm	70 - 88
12.5 mm	55 - 78
9.5 mm	45 - 72
4.75 mm	30 - 57
2.36 mm	20 - 46
1.18 mm	14 - 35
600 µm	9 - 27
300 µm	5 - 19
150 µm	2 - 12
75 µm	0 - 6

365.2 .3 Engineered fill shall not contain any friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate prone to decomposition or disintegration.

.4 Engineered fill shall not present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the Work.

.5 The material, when tested by the Micro-Deval test method in accordance with MTO LS-618, shall have a Micro-Deval loss not greater than 30%.

365.2 .6 The Owner reserves the right to reject any source of supply of engineered fill solely on the basis of past field performance, documented by the records and experience of the Owner and/or the Engineer, regardless of compliance with gradation or physical requirements.

365.3 SUBMITTALS

.1 The Contractor shall advise the Engineer a minimum of 7 Days prior to start of placing of any engineered fill.

.2 Where engineered fill placement occurs between November 1st and May 1st, the Contractor shall submit, for approval, the proposed method of protection to prevent freezing of the engineered fill.

365.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The excavation for; and the placement of; the engineered fill must be one continuous operation, from commencement of the Work up to and until the engineered fill placement is completed up to the specified elevation.

.3 The in-situ material, on which the engineered fill is to be founded, shall be compacted to a depth of 300 mm below the placement grade in accordance with Item 936 and to a minimum of 98% of the maximum dry density.

.4 The engineered fill shall be placed on a firm, dry base and shall be placed in lifts not exceeding 200 mm and compacted in accordance with Item 936, to a minimum of 95% of the ASTM D1557 (modified Proctor) maximum dry density.

  .1 Adjacent fill material shall be placed simultaneously and maintained at the same elevation as the engineered fill.

.5 Neither the excavation below existing grade, nor the engineered fill as supplied or after placement, shall be permitted to freeze until after the bearing concrete has been cast.

.6 The tolerances in elevation for the placement of the engineered fill shall meet the requirements of Table 365-2.

Table 365-2
Tolerances For Placement Of Engineered Fill

Surface	Tolerance in Elevation
Base of Engineered Fill	± 5% of the nominal thickness of the engineered fill specified in the Contract Documents
Top of Engineered Fill	± 25 mm

365.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of cubic metres of engineered fill supplied and placed in accordance with this Item.

.2 The measurement shall be calculated based on the payment lines as indicated in the Contract Documents.

365.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

.2 Haulage for engineered fill shall be paid for in accordance with Item 801.

366.1 DESCRIPTION

.1 This Item consists of supply and placement of free-draining backfill.

366.2 MATERIALS

.1 The Contractor shall supply all materials.

.2 Free-draining backfill shall be clean, sound durable crushed rock, crushed gravel or pit run gravel.

.3 Free-draining backfill shall meet the grading requirements shown in Table 366-1, when tested in accordance with ASTM C136.

Table 366-1
Free-Draining Backfill Gradation

ASTM Sieve Size	Percent Passing
63 mm	100
50 mm	90 - 100
25 mm	35 - 100
19 mm	15 - 85
12.5 mm	0 - 53
9.5 mm	0 - 30
4.75 mm	0 - 4
1.18 mm	0 - 2

366.2.3 .1 Concrete aggregates meeting the specified limits in Table 302-3 may be approved for supply under this Item.

366.3 SUBMITTALS

.1 The Contractor shall submit the source of material for approval in advance of obtaining the free-draining backfill.

.2 The Contractor shall submit a request in writing for approval of the use of concrete aggregates as a source of supply for this Item.

366.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

366.4 .2 When the water table is below the bottom of the free-draining backfill, positive drainage of the free-draining backfill shall be provided as indicated in the Contract Documents and/or on the Standard Drawing 366-1.

.3 Free-draining backfill shall be placed simultaneously with the placing of adjacent embankment material.

.4 The free-draining backfill shall be placed to the dimensions as indicated in the Contract Documents and/or on the Standard Drawing 366-1.

366.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of cubic metres of free-draining backfill supplied and placed in accordance with this Item.

.2 The measurement shall be calculated based on the payment lines as indicated in the Contract Documents.

366.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

371.1 DESCRIPTION

.1 This Item consists of the removal and disposal of the existing asphalt concrete, including the waterproofing system, from a Bridge deck.

371.2 MATERIALS

.1 None identified.

371.3 SUBMITTALS

.1 None identified.

371.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All removed materials shall become the property of the Contractor and shall be disposed of outside of the Work Site.

.3 The Contractor must take care when removing the existing asphalt concrete so as not to damage the concrete Bridge deck, steel orthotropic Bridge deck, Roadway drains, joints, curbs and other abutting components of the Structure.

  .1 The Contractor shall be responsible, at his own expense, for the repair and/or replacement of such damage resulting from the Work.

.4 All asphalt concrete shall be completely removed, including any deck waterproofing system which may be in place, to expose and leave bare the Portland cement concrete surface or steel orthotropic Bridge deck.

.5 The Contractor shall not be allowed to remove the existing asphalt from the Bridge deck by cold milling.

.6 The approach asphalt shall be removed in a stepped fashion to avoid a vertical face full depth of the asphalt at the interface of new and old asphalt.

371.5 MEASUREMENT FOR PAYMENT

.1 The removal and disposal of the asphalt concrete carried out in accordance with this Item shall be on a lump sum basis.

371.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.

372.1 DESCRIPTION

.1 This Item consists of the removal and disposal of deck concrete from a Structure.

372.2 MATERIALS

.1 None identified.

372.3 SUBMITTALS

.1 The Contractor shall submit the proposed method and sequencing of the removal at least 14 Days prior to the commencement of the Work.

372.4 CONSTRUCTION

.1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The removal of the asphalt concrete to bare exposed concrete surface shall be carried out under Item 371.

.3 All Equipment used to remove the unsound concrete from the repair areas shall be subject to the approval of the Engineer.

.4 All removed materials generated as a result of the Work shall be the property of the Contractor and shall be disposed of outside the Work Site.

.5 Unless otherwise specified the railing and rail posts are to remain in place during the construction operations and the Contractor shall ensure that no damage to these articles occurs during the Work.

.6 The Contractor shall take all care not to damage any portion of the Superstructure and supports during the Work.

.7 The Contractor shall pay particular attention to the flow of traffic through the construction zone and any damage incurred to vehicles or their cargo or injury sustained to their occupants as direct or indirect result of the Contractor's action, procedures or negligence, shall be the sole responsibility of the Contractor.

   .1 The Contractor shall indemnify and save harmless the Owner with regards to claims arising from damages or injuries.

8 The Contractor shall be responsible to ensure the security of the fall area below the Structure.

372.4.1 .9 The Contractor will be required to remove all concrete rubble and other waste from piers and abutments and from the Work Site before the Contract is completed.

.10 The Contractor shall be responsible, at his own expense, for any damage or loss of adjacent and abutting features.

372.4 .2 Type A - Partial Depth Removal

.1 This section consists of the partial depth removal and disposal of loose and unsound concrete.

.2 The actual locations, area and extent of removal will be determined on the site by the Engineer.

.3 Partial depth removal shall apply to but is not limited to

  .1 Sidewalks and curbs;

  .2 the top surface of decks; and

  .3 barrier walls, endposts and ballastwalls.

.4 Concrete shall be removed in such a manner as to prevent damage to adjacent concrete, other components and utilities that are to remain in place.

.5 Reinforcing steel, prestressing tendons, shear connectors, structural steel and other components to remain in place shall not be damaged or loosened.

.6 Hammers shall not come in contact with reinforcing bars in a manner which will cause debonding of bars in adjacent concrete areas not being repaired.

.7 Concrete removal will not be permitted within 1 m of newly placed concrete for a period of 72 hours.

.8 The unsound and delaminated areas of the concrete deck slab, curbs and endposts, as determined by the Engineer, shall be saw cut along all edges to a depth of approximately 15 mm orientated perpendicular to the original concrete surface.

  .1 Concrete shall be removed to a minimum of 20 mm below the bottom bar of the top mat of reinforcing steel.

    .1 Any additional unsound concrete, beyond the minimum specified, shall also be removed from these areas.

  .2 Removal of concrete beyond the specified limit, shall only be carried out when directed by the Engineer.

.9 All of the exposed reinforcing steel within these repair areas shall be cleaned by sandblasting (or Engineer approved alternate method) such that it is free of scale, rust and concrete.

372.4.2 .10 The maximum size of the air hammer to be used when removing concrete around reinforcing steel shall be 156 N.

.11 In areas where the top mat of reinforcing steel is completely exposed, the bars shall be retied at each intersection point.

372.4 .3 Type B - Full Depth Removal

.1 This section consists of the full depth removal and disposal of concrete.

.2 The actual locations, area and extent of removal will be determined on the site by the Engineer.

.3 Full depth removal areas shall be saw cut along all edges, perpendicular to the existing concrete surface, to a depth of 25 mm or to the top layer of reinforcing steel whichever is less.

.4 All of the exposed reinforcing steel within these repair areas shall be cleaned by sandblasting (or Engineer approved alternate method) such that they are free of scale, rust and concrete

.5 Care shall be taken not to damage, cut or loosen the reinforcing steel.

.6 Exposed reinforcing steel shall be retied at each intersection point.

.7 The Contractor must take care during the removal of deck concrete in the curb areas so as not to damage the existing reinforcing steel, granite curbing, railposts and railing in any way.

.8 The Contractor shall employ methods approved by the Engineer to protect the steel Superstructure from falling concrete debris.

372.4 .4 Type C - Complete Removal

.1 This section consists of the complete removal and disposal of concrete above the girders/floor stringers of a Structure.

.2 The use of explosives shall not be permitted.

.3 The Contractor shall not drop any materials from the Bridge deck area.

.4 The Contractor shall clearly mark, on the surface of the Bridge deck, the locations of the supporting members in advance to performing saw cutting and/or jack hammering operations in order to prevent cutting, nicking or spalling of the supporting members.

.5 Where supporting members have shear connections or stirrups embedded in the deck slab, the Contractor shall employ concrete removal methods that will not result in damage to those embedded elements nor the supporting members.

372.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of deck concrete removed and disposed of in accordance with this Item.

372.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of removal, as identified under the Contract.

381.1 DESCRIPTION

.1 This Item consists of the removal of Structure(s) including the disposal of all debris.

381.2 MATERIALS

.1 None identified.

381.3 SUBMITTALS

.1 The Contractor shall submit drawings and design calculations in accordance with Item 956.

.2 The Contractor shall submit to the Engineer, upon request, at least 14 days prior to the commencement of the Work, the proposed method and sequencing of the removal of the Structure for approval by the Engineer and the Department of the Environment and Local Government.

  .1 The submittal shall include the proposed method for the capture and removal of the debris from the Structure, the proposed retention system for preventing the material from falling into the wetted portion of the watercourse and techniques to be used for the removal of any material which inadvertently falls into the watercourse.

381.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 For Structures in or over watercourses, the Contractor shall carry out the Work in accordance with Item 948 and the following:

  .1 The Structure shall be removed without releasing harmful materials or contaminants into the watercourse.

  .2 The removal of material which falls into the river shall be accomplished without stationing equipment in the wetted portion of the watercourse or disturbing the riverbed.

.3 The Contractor shall protect public traffic from the dust and debris resulting from the Work.

.4 Explosives will not be permitted for demolition.

.5 All Work shall be carried out in accordance with CAN/CSA S350 - "Code of Practice for Safety in Demolition of Structures".

  .1 The Structure shall be removed in such a manner to eliminate contact with the riverbed.

381.4 .6 The following conditions shall apply for buried portions of the Structures:

  .1 Foundation excavation for the Work shall be carried out in accordance with 161.4.

  .2 Backfilling of the Work Area shall be carried out in accordance with 106.4 or 108.4, depending on the backfill material to be placed.

.7 All waste and demolition debris shall become the property of the Contractor and shall be disposed of outside the Work Site at an approved Construction and Demolition Material Disposal Site.

  .1 Waste and demolition debris shall be recycled where possible.

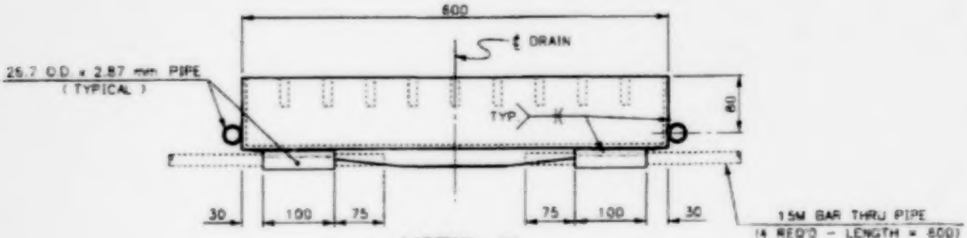
.8 Any damage to the riverbed or to portions of the Structure which are to remain in place shall be repaired by the Contractor at his own expense.

381.5 MEASUREMENT FOR PAYMENT

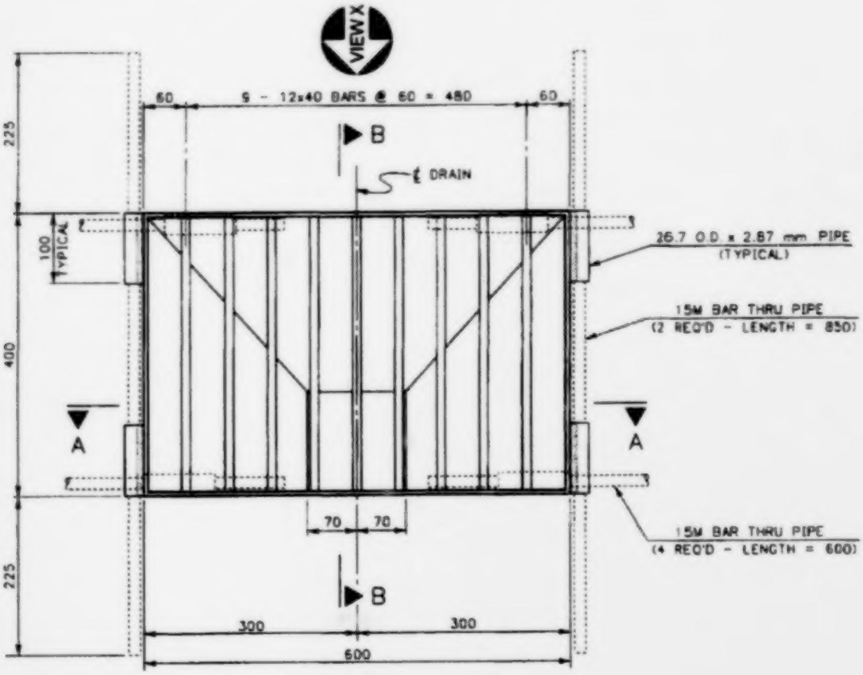
.1 The removal of a Structure(s) in accordance with this Item shall be on a lump sum basis.

381.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Lump Sum Price.


600
℄ DRAIN
26.7 O.D. x 2.87 mm PIPE
(TYPICAL)
TYP
80
30
100
75
75
100
30
15M BAR THRU PIPE
(4 REQ'D - LENGTH = 600)

VIEW X


VIEW X
60
9 - 12x40 BARS @ 60 = 480
60
B
℄ DRAIN
225
100 TYPICAL
400
225
26.7 O.D. x 2.87 mm PIPE
(TYPICAL)
15M BAR THRU PIPE
(2 REQ'D - LENGTH = 850)
A
A
15M BAR THRU PIPE
(4 REQ'D - LENGTH = 600)
70
70
B
300
300
600

PLAN

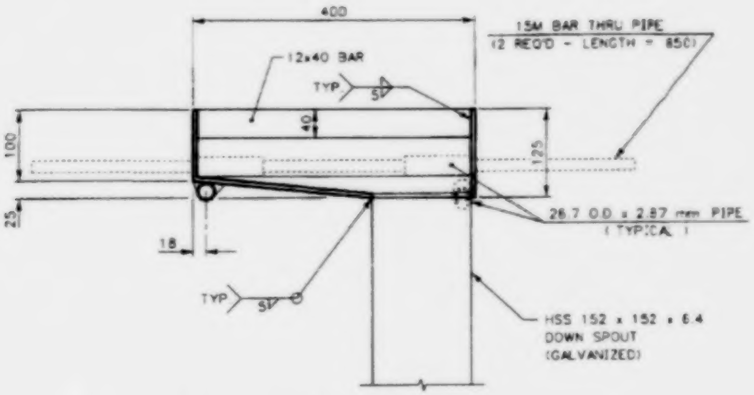
NOTES:

- MATERIALS = STEEL: CAN/CSA - G40.20/G40.21 - M92 - TYPE 300W
  REINFORCING: CSA G30.12, GRADE 400
- WELDING = CSA W47.1 - 1983 AND CSA W59 - M1989
- ALL STEEL PLATES ARE TO BE 6mm THICK UNLESS OTHERWISE NOTED.
- ALL WELDERS SHALL BE CERTIFIED BY THE CWB TO CAN/CSA W47.1 SPECIFICATIONS, AND/OR TO A CERTIFICATION LEVEL OF QUALIFIED WELDER AS ISSUED BY THE PROVINCE OF NEW BRUNSWICK.
- DECK DRAIN ASSEMBLIES TO BE GALVANIZED BY HOT DIPPING IN ACCORDANCE WITH CAN/CSA G-164, TO A MINIMUM THICKNESS OF 175 um AND/OR A MINIMUM APPLICATION RATE OF 1 kg/m^2.
- 15M REINFORCING BARS SHALL BE SUPPLIED WITH DRAINS.

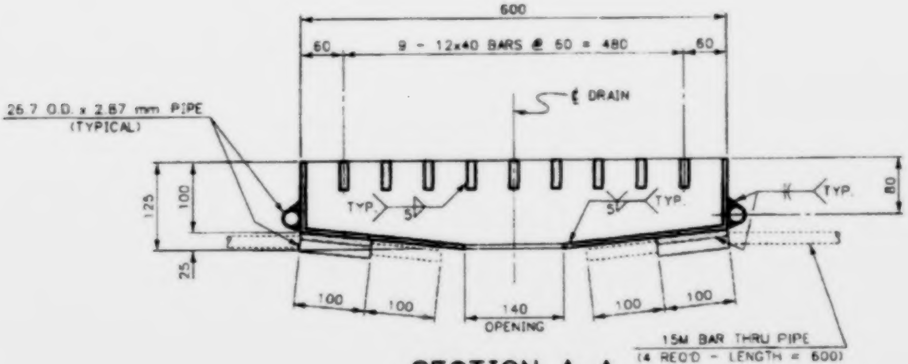
DOWN SPOUT/ SECTION DETAILS ON STANDARD DRAWING 302-2

Roadway Drain For Structures

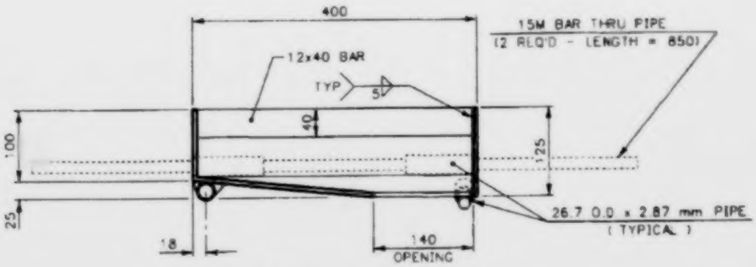
File: 302-1


400
15M BAR THRU PIPE
(2 REQ'D - LENGTH = 850)
12x40 BAR
TYP.
5
40
100
125
25
18
26.7 O.D. x 2.87 mm PIPE
(TYPICAL)
TYP.
5
HSS 152 x 152 x 6.4
DOWN SPOUT
(GALVANIZED)

DOWN SPOUT DETAIL


600
60
9 - 12x40 BARS @ 60 = 480
60
℄ DRAIN
26.7 O.D. x 2.87 mm PIPE
(TYPICAL)
TYP.
5
5
TYP.
TYP.
125
100
80
25
100
100
140
OPENING
100
100
15M BAR THRU PIPE
(4 REQ'D - LENGTH = 600)

SECTION A-A

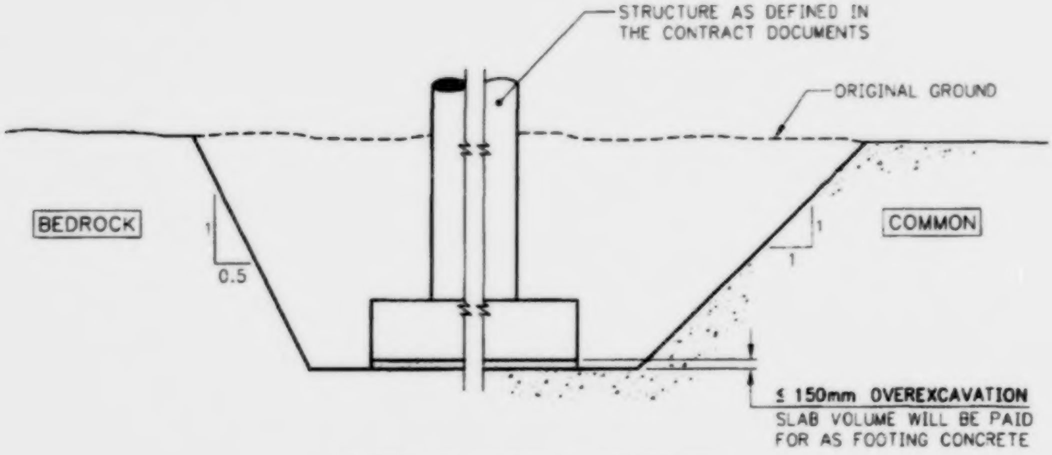

400
15M BAR THRU PIPE
(2 REQ'D - LENGTH = 850)
12x40 BAR
TYP.
5
40
100
125
25
18
140
OPENING
26.7 O.D. x 2.87 mm PIPE
(TYPICAL)

SECTION B-B

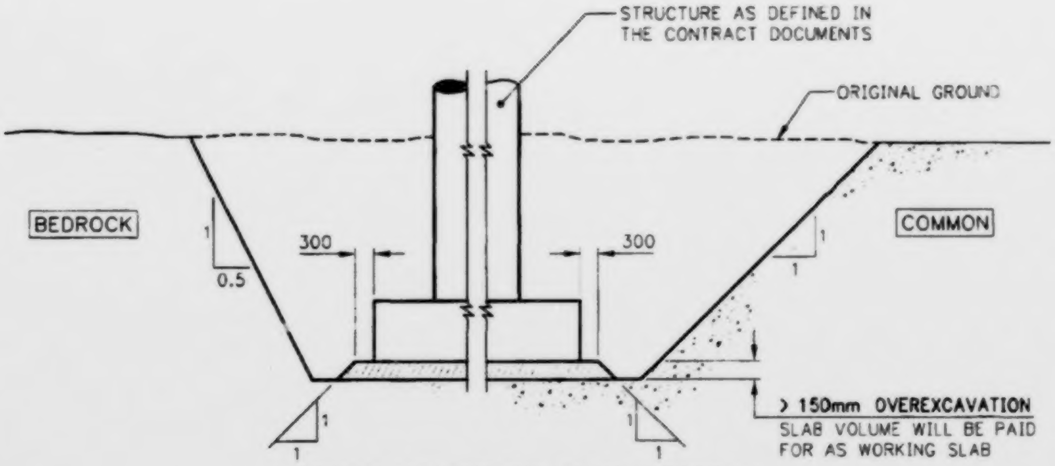
PLAN / VIEW X ON STANDARD DRAWING 302-1

File: 302-2

Roadway Drain Details


STRUCTURE AS DEFINED IN THE CONTRACT DOCUMENTS
ORIGINAL GROUND
BEDROCK
1
0.5
COMMON
1
1
≤ 150mm OVEREXCAVATION
SLAB VOLUME WILL BE PAID FOR AS FOOTING CONCRETE

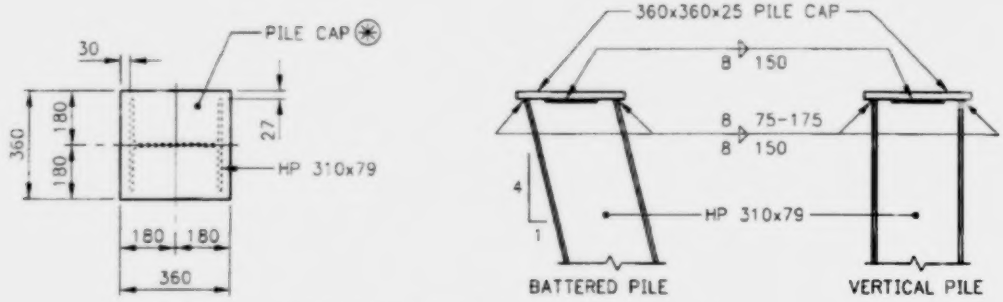
LIMITS OF FOOTING CONCRETE


STRUCTURE AS DEFINED IN THE CONTRACT DOCUMENTS
ORIGINAL GROUND
BEDROCK
1
0.5
300
300
COMMON
1
1
1
1
1
1
> 150mm OVEREXCAVATION
SLAB VOLUME WILL BE PAID FOR AS WORKING SLAB

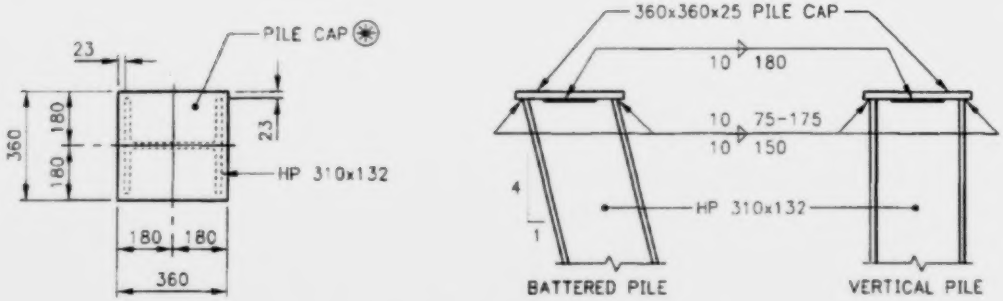
LIMITS OF WORKING SLAB CONCRETE

Concrete Limits For Foundation Overexcavation

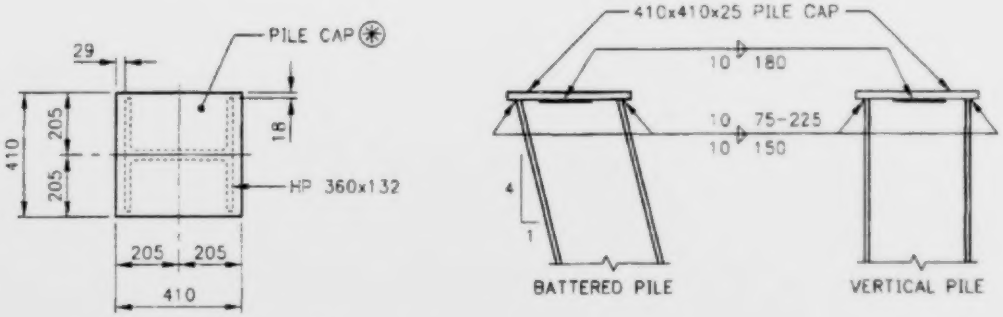
File: 302-3


PILE CAP ⊛
30
27
360
180
180
HP 310x79
180
180
360
360x360x25 PILE CAP
8 150
8 75-175
8 150
4
1
HP 310x79
BATTERED PILE
VERTICAL PILE

PILE CAP DETAILS FOR HP 310x79


PILE CAP ⊛
23
23
360
180
180
HP 310x132
180
180
360
360x360x25 PILE CAP
10 180
10 75-175
10 150
4
1
HP 310x132
BATTERED PILE
VERTICAL PILE

PILE CAP DETAILS FOR HP 310x132

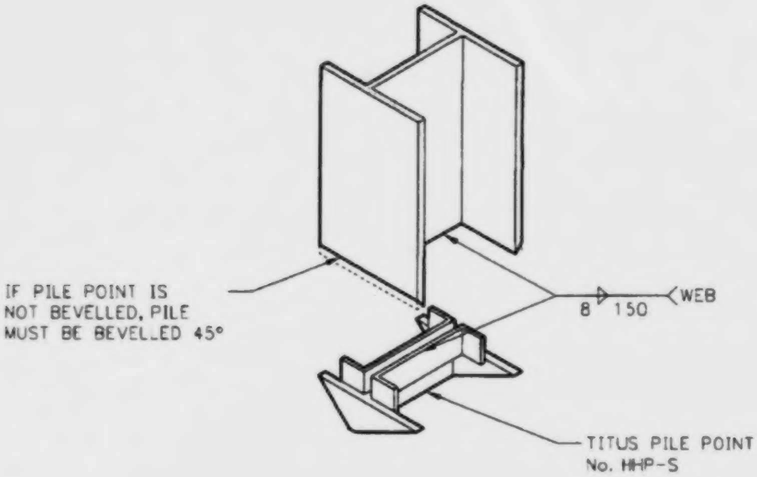

PILE CAP ⊛
29
18
410
205
205
HP 360x132
205
205
410
410x410x25 PILE CAP
10 180
10 75-225
10 150
4
1
BATTERED PILE
VERTICAL PILE

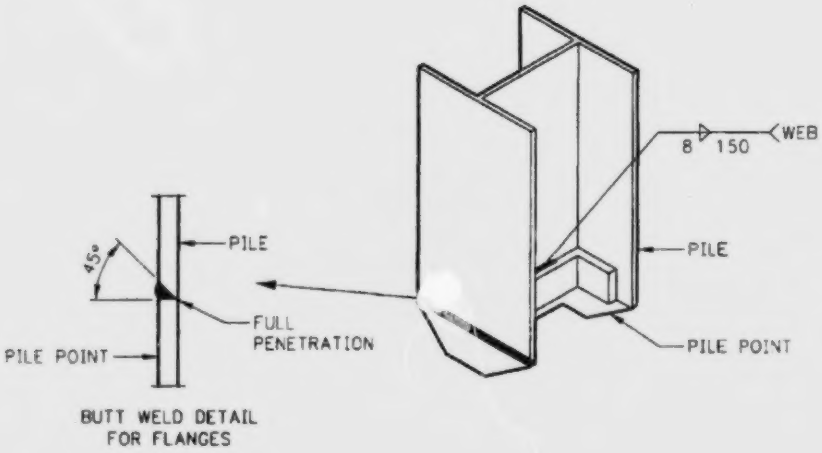
PILE CAP DETAILS FOR HP 360x132

⊛ PILE CAP PLATE SIZE BASED ON NOMINAL PILE DIMENSIONS

Steel H Piles
Pile Cap Details

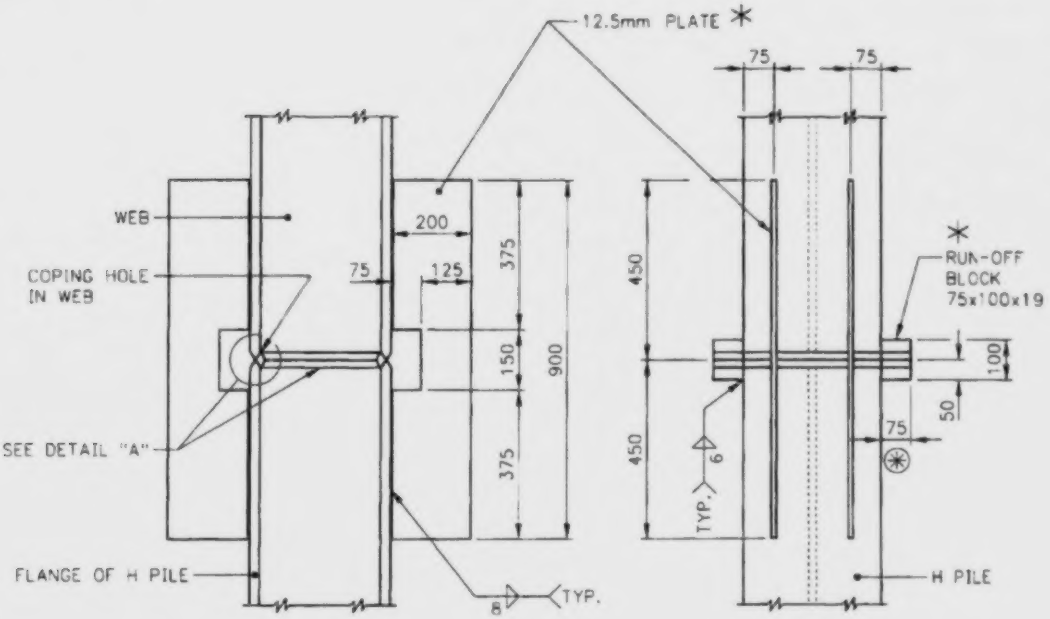
File: 311-1


IF PILE POINT IS NOT BEVELLED, PILE MUST BE BEVELLED 45°
8 150 WEB
TITUS PILE POINT No. HHP-S


8 150 WEB
45°
PILE
FULL PENETRATION
PILE POINT
BUTT WELD DETAIL FOR FLANGES
PILE
PILE POINT

Steel H Piles
Pile Point Details

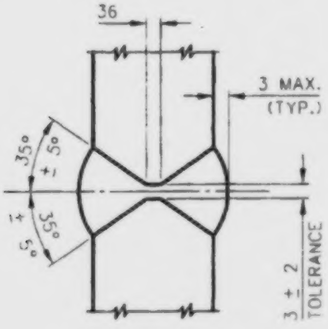
File: 311-2


12.5mm PLATE ✱
75
75
WEB
200
COPING HOLE IN WEB
75
125
375
150
900
375
450
450
SEE DETAIL "A"
FLANGE OF H PILE
8
TYP.
✱
RUN-OFF BLOCK 75x100x19
100
50
75
⊛
TYP.
6
H PILE

⊛ MAY BE REDUCED TO 50 WHEN SPLICES ARE CHECKED BY NON-DESTRUCTIVE TEST METHOD.

✱ REMOVE AFTER SPLICE IS FINISHED AND GRIND FLUSH.

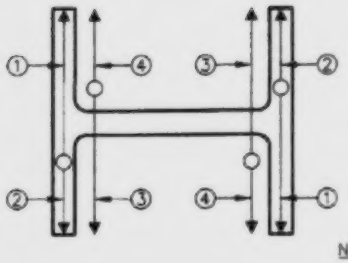
VERTICAL ALIGNMENT FOR H PILE SPLICING


36
3 MAX. (TYP.)
35° ± 5°
35° ± 5°
3 ± 2 TOLERANCE

DETAIL "A"

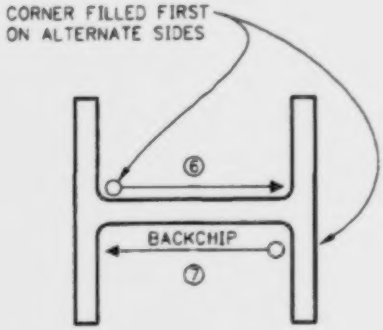
Steel H Piles
Splice Details

File: 311-3

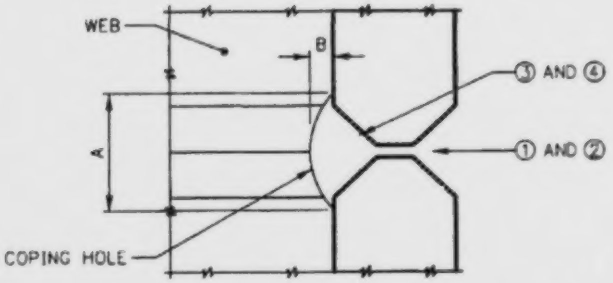


NOTE:
WELD PASSES ① AND ② ARE AT THE CENTER LINE OF THE FLANGES AND WELD PSSES ③ AND ④ ARE ON THE INSIDE OF THE FLANGES

SEQUENCE OF
WELDING FLANGES


CORNER FILLED FIRST
ON ALTERNATE SIDES
⑥
BACKCHIP
⑦

SEQUENCE OF
WELDING WEB


WEB
B
A
③ AND ④
① AND ②
COPING HOLE

"A" APPROX. 4mm LARGER THAN EDGE OF GROOVE

"B" LARGE ENOUGHT TO ALLOW THE WELD TO START BEYOND THE WEB WITH A MAX. TIP OF 7° OF THE ELECTRODE

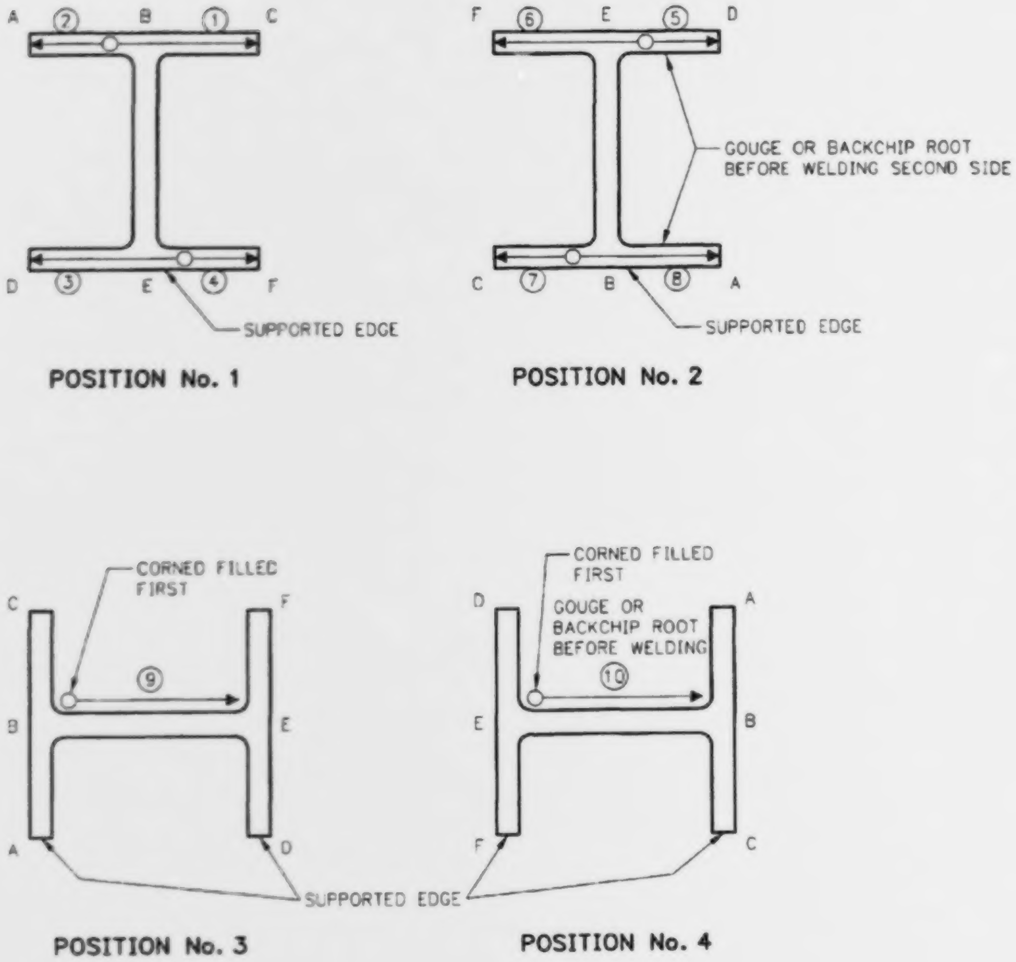
BACKCHIP ① AND ② TO SOUND METAL BEFORE DEPOSITION OF PASSES ③ AND ④

COPING HOLE DETAIL

Steel H Piles
Sequences for Welds for Horizontal Position

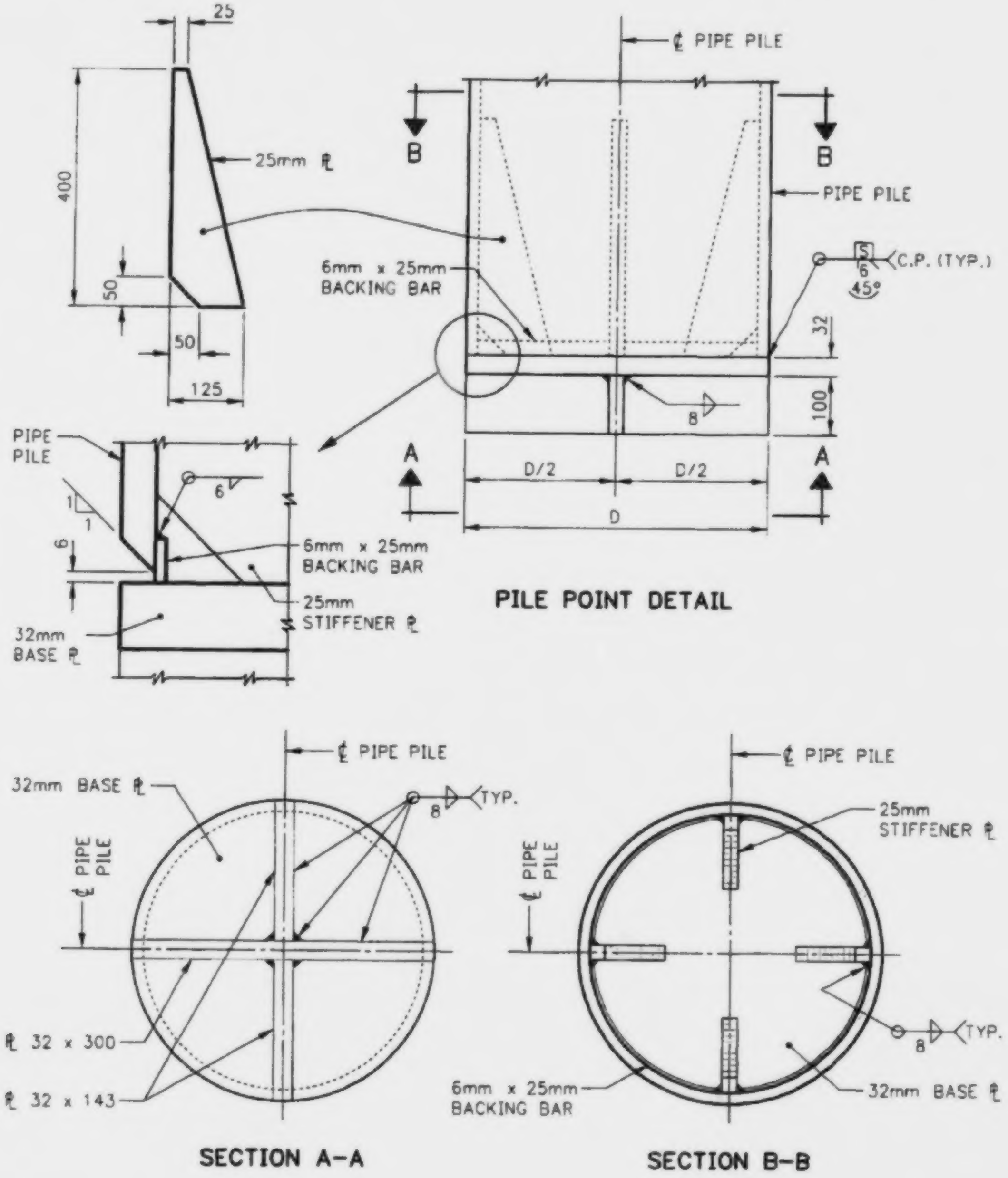
File: 311-4

NOTE:
WELD TO BE COMPLETE AS SHOWN BY THE NUMBERED SEQUENCE


A
②
B
①
C
D
③
E
④
F
SUPPORTED EDGE
POSITION No. 1
F
⑥
E
⑤
D
GOUGE OR BACKCHIP ROOT BEFORE WELDING SECOND SIDE
C
⑦
B
⑧
A
SUPPORTED EDGE
POSITION No. 2
CORNED FILLED FIRST
C
F
⑨
B
E
A
D
POSITION No. 3
CORNED FILLED FIRST
D
A
GOUGE OR BACKCHIP ROOT BEFORE WELDING
⑩
E
B
F
C
SUPPORTED EDGE
POSITION No. 4

Steel H Piles
Sequences for Welds for Flat Position

File: 311-5



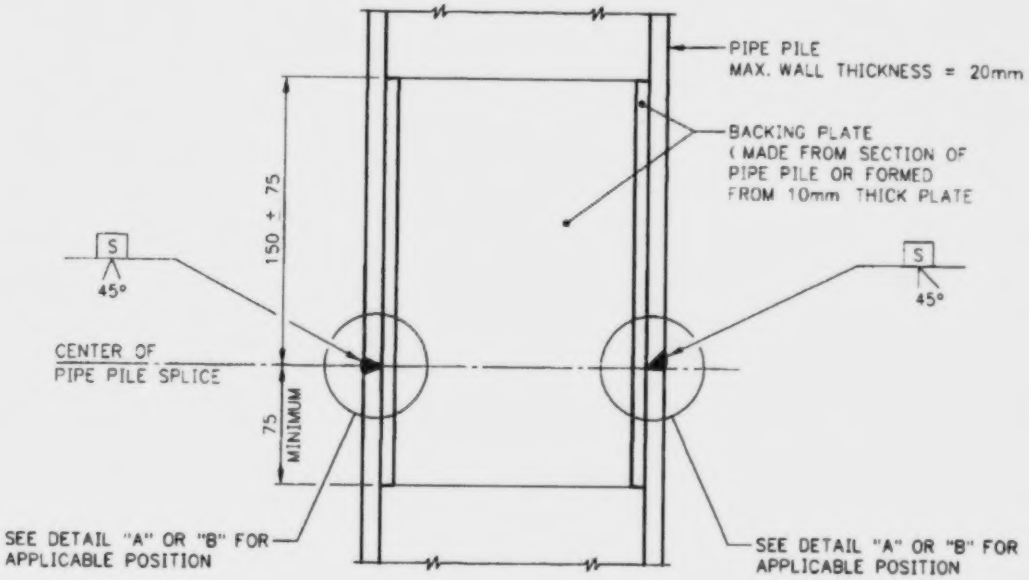
PILE POINT DETAIL

SECTION A-A

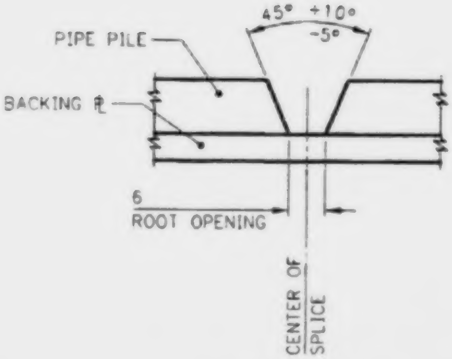
SECTION B-B

25
400
25mm ℞
50
50
125
℄ PIPE PILE
B
B
PIPE PILE
C.P. (TYP.)
S
6
45°
6mm x 25mm
BACKING BAR
32
100
8
A
A
D/2
D/2
D
PIPE
PILE
1
1
6
6
6mm x 25mm
BACKING BAR
25mm
STIFFENER ℞
32mm
BASE ℞
℄ PIPE PILE
32mm BASE ℞
TYP.
8
℄ PIPE PILE
℞ 32 x 300
℞ 32 x 143
℄ PIPE PILE
25mm
STIFFENER ℞
℄ PIPE PILE
TYP.
8
32mm BASE ℞
6mm x 25mm
BACKING BAR

Steel Pipe Piles
Pile Point Details

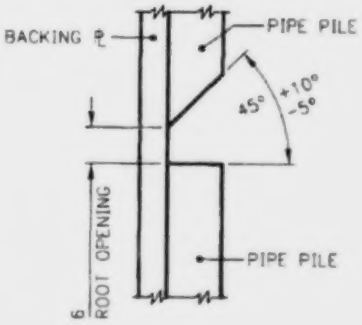

PIPE PILE
MAX. WALL THICKNESS = 20mm
BACKING PLATE
(MADE FROM SECTION OF
PIPE PILE OR FORMED
FROM 10mm THICK PLATE
150 + 75
S
45°
S
45°
CENTER OF
PIPE PILE SPLICE
75
MINIMUM
SEE DETAIL "A" OR "B" FOR
APPLICABLE POSITION
SEE DETAIL "A" OR "B" FOR
APPLICABLE POSITION

SECTION OF PILE


45° +10°
-5°
PIPE PILE
BACKING ℞
6
ROOT OPENING
CENTER OF
SPLICE

DETAIL "A"

FLAT, VERTICAL OR OVERHEAD
POSITION

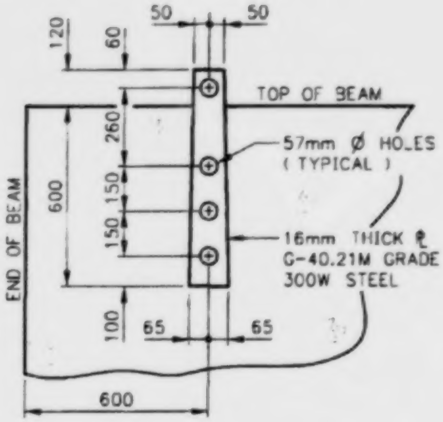

BACKING ℞
PIPE PILE
45°
+10°
-5°
6
ROOT OPENING
PIPE PILE

DETAIL "B"

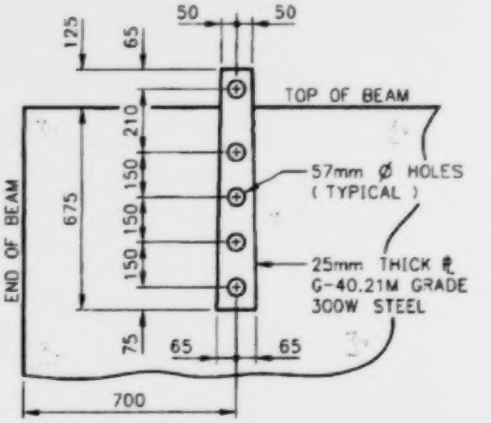
HORIZONTAL POSITION

File: 312-2

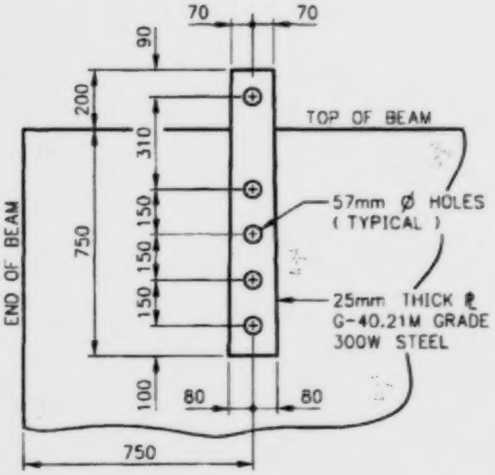
Steel Pipe Piles
Splice Details


120
60
50
50
TOP OF BEAM
260
150
150
600
END OF BEAM
57mm Ø HOLES
(TYPICAL)
16mm THICK ℄
G-40.21M GRADE
300W STEEL
100
65
65
600

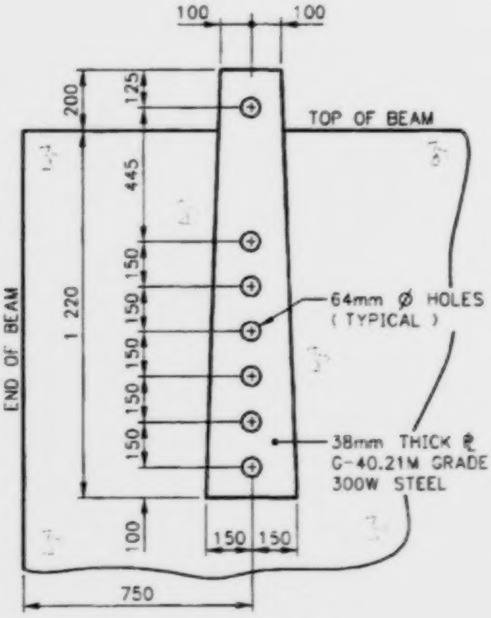
AASHTO TYPE II BEAM


125
65
50
50
TOP OF BEAM
210
150
150
150
675
END OF BEAM
57mm Ø HOLES
(TYPICAL)
25mm THICK ℄
G-40.21M GRADE
300W STEEL
75
65
65
700

AASHTO TYPE III BEAM


70
70
90
200
310
TOP OF BEAM
150
150
150
150
750
END OF BEAM
57mm Ø HOLES
(TYPICAL)
25mm THICK ℄
G-40.21M GRADE
300W STEEL
100
80
80
750

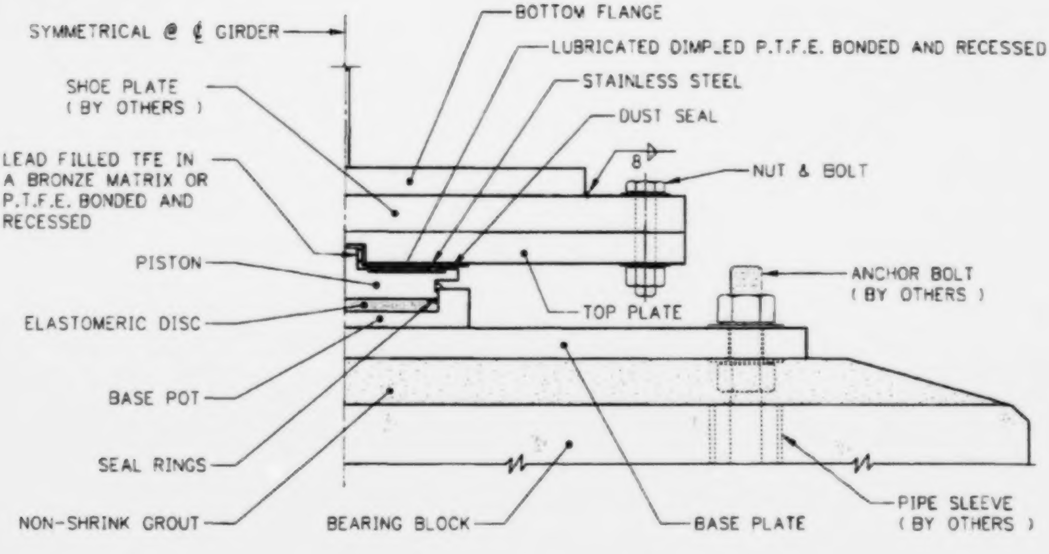
AASHTO TYPE IV BEAM
NBDOT TYPE I BEAM


100
100
200
125
TOP OF BEAM
445
150
150
150
150
150
1 220
END OF BEAM
64mm Ø HOLES
(TYPICAL)
38mm THICK ℄
G-40.21M GRADE
300W STEEL
100
150
150
750

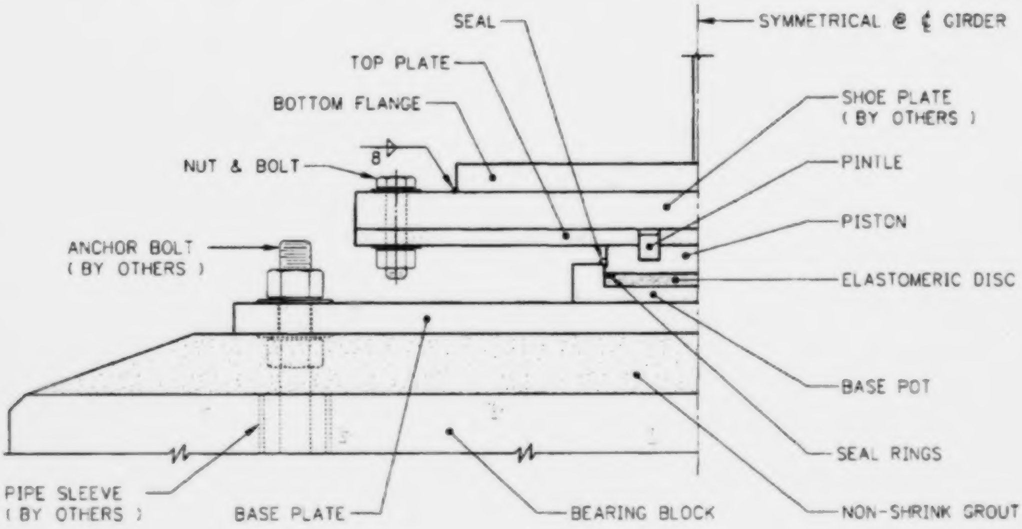
BULB-TEE BEAM

Prestressed Beam Lifting Device Details
Vertical Only

File: 331-1


SYMMETRICAL @ ¢ GIRDER
BOTTOM FLANGE
LUBRICATED DIMPLED P.T.F.E. BONDED AND RECESSED
STAINLESS STEEL
DUST SEAL
SHOE PLATE (BY OTHERS)
LEAD FILLED TFE IN A BRONZE MATRIX OR P.T.F.E. BONDED AND RECESSED
8
NUT & BOLT
PISTON
ANCHOR BOLT (BY OTHERS)
TOP PLATE
ELASTOMERIC DISC
BASE POT
SEAL RINGS
NON-SHRINK GROUT
BEARING BLOCK
BASE PLATE
PIPE SLEEVE (BY OTHERS)

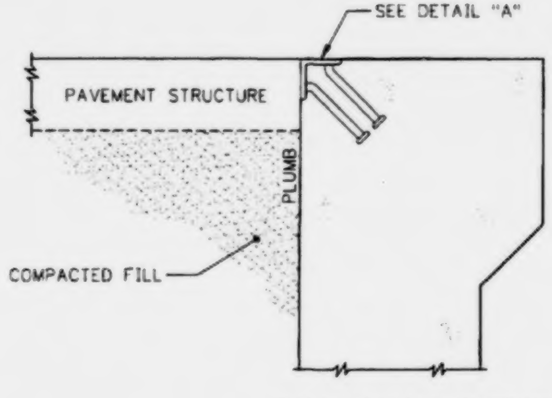
CONSTRAINED SLIDING BEARING


SEAL
SYMMETRICAL @ ¢ GIRDER
TOP PLATE
BOTTOM FLANGE
SHOE PLATE (BY OTHERS)
8
NUT & BOLT
PINTLE
PISTON
ANCHOR BOLT (BY OTHERS)
ELASTOMERIC DISC
BASE POT
SEAL RINGS
PIPE SLEEVE (BY OTHERS)
BASE PLATE
BEARING BLOCK
NON-SHRINK GROUT

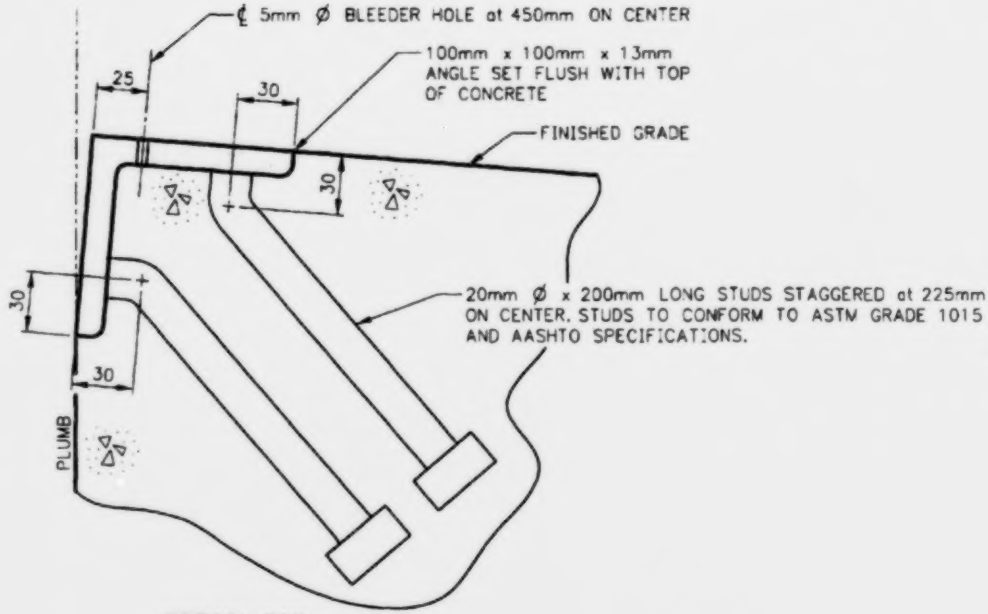
FIXED BEARING

Bridge Pot Bearings
Nomenclature

File: 342-1


SEE DETAIL "A"
PAVEMENT STRUCTURE
PLUMB
COMPACTED FILL

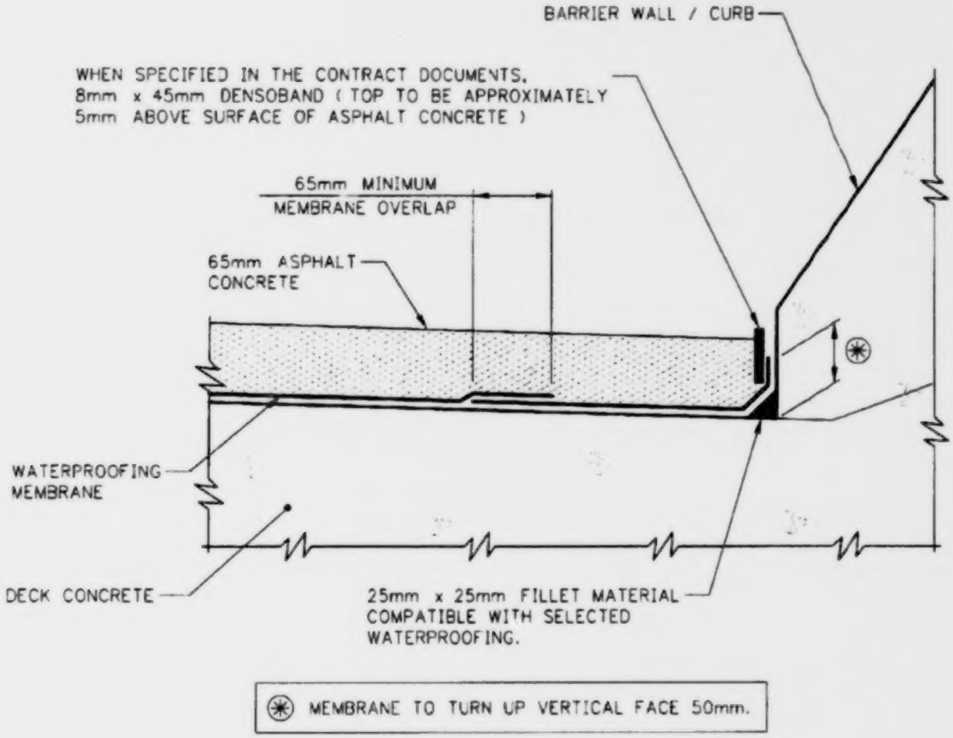
BALLASTWALL SECTION


℄ 5mm Ø BLEEDER HOLE at 450mm ON CENTER
100mm x 100mm x 13mm ANGLE SET FLUSH WITH TOP OF CONCRETE
25
30
FINISHED GRADE
30
30
30
20mm Ø x 200mm LONG STUDS STAGGERED at 225mm ON CENTER. STUDS TO CONFORM TO ASTM GRADE 1015 AND AASHTO SPECIFICATIONS.
PLUMB

DETAIL "A"

Ballastwall Protection Details

File: 345-1


BARRIER WALL / CURB
WHEN SPECIFIED IN THE CONTRACT DOCUMENTS, 8mm x 45mm DENSOBAND (TOP TO BE APPROXIMATELY 5mm ABOVE SURFACE OF ASPHALT CONCRETE)
65mm MINIMUM MEMBRANE OVERLAP
65mm ASPHALT CONCRETE
WATERPROOFING MEMBRANE
DECK CONCRETE
25mm x 25mm FILLET MATERIAL COMPATIBLE WITH SELECTED WATERPROOFING.
✱
✱ MEMBRANE TO TURN UP VERTICAL FACE 50mm.

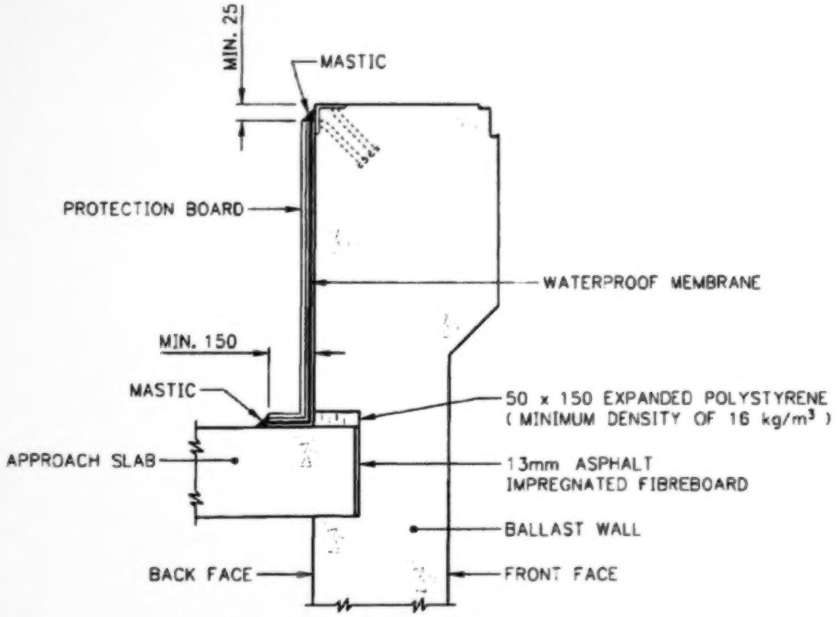
SECTION THROUGH DECK AT BARRIER WALL / CURB SHOWING WATERPROOFING SYSTEM

NOTES:

- OVERLAP MEMBRANE IN PRINCIPLE DIRECTION OF WATER FLOW AND IN DIRECTION OF ASPHALT CONCRETE PLACEMENT.
- FOR NORMAL CROWN - INSTALL STARTER STRIP FIRST.
  FOR SUPERELEVATION - INSTALL STARTER STRIP ON HIGH SIDE LAST.

File: 351-1

Deck at Barrier Wall/Curb Waterproofing Details


MIN. 25
MASTIC
PROTECTION BOARD
WATERPROOF MEMBRANE
MIN. 150
MASTIC
50 x 150 EXPANDED POLYSTYRENE (MINIMUM DENSITY OF 16 kg/m³)
APPROACH SLAB
13mm ASPHALT IMPREGNATED FIBREBOARD
BALLAST WALL
BACK FACE
FRONT FACE

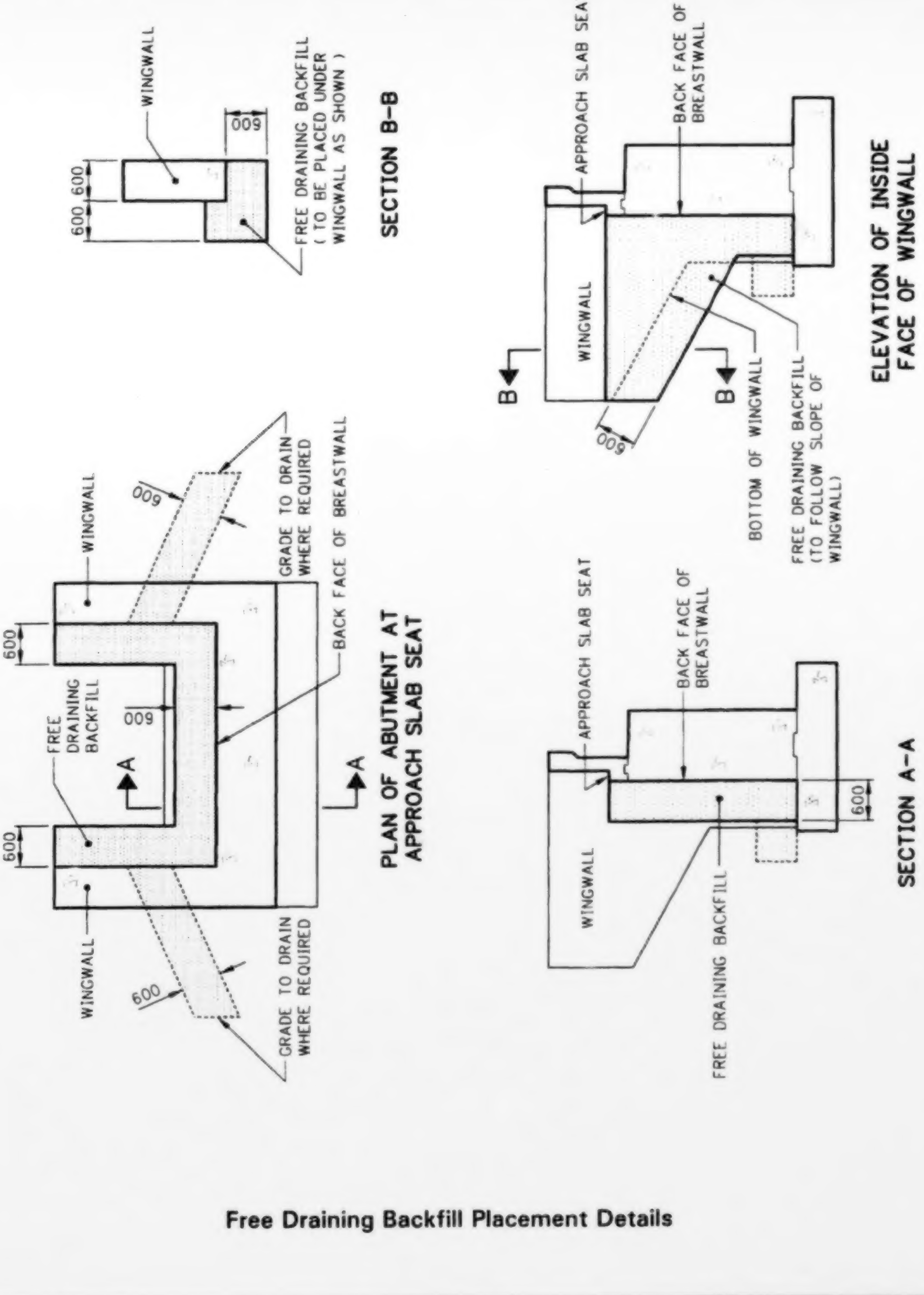
SECTION THROUGH BALLAST WALL SHOWING WATERPROOFING SYSTEM

NOTES:

- ALL PROTECTION BOARD TO BE APPLIED ON TOP OF THE WATERPROOFING SYSTEM AND ADHERED TO THE MEMBRANE WITH THE SPECIFIED MASTIC PLACED AS GOBS ON 600mm CENTERS BETWEEN THE TWO SURFACES.
- ALL PROTECTION BOARD TO BE BUTTED TIGHTLY.
- ALL TERMINATIONS TO BE SEALED BY AN EDGE BEAD OF MASTIC.
- ALL MEMBRANE SHALL BE PLACED VERTICALLY AND OVERLAPPED A MINIMUM OF 65mm WITH ADJACENT SHEETS..

File: 351-2

Ballast Wall Waterproofing System Details


WINGWALL
600
600
600
FREE DRAINING BACKFILL (TO BE PLACED UNDER WINGWALL AS SHOWN)
SECTION B-B
APPROACH SLAB SEAT
BACK FACE OF BREASTWALL
WINGWALL
B
B
600
BOTTOM OF WINGWALL
FREE DRAINING BACKFILL (TO FOLLOW SLOPE OF WINGWALL)
ELEVATION OF INSIDE FACE OF WINGWALL
WINGWALL
FREE DRAINING BACKFILL
600
600
600
600
600
A
A
GRADE TO DRAIN WHERE REQUIRED
BACK FACE OF BREASTWALL
GRADE TO DRAIN WHERE REQUIRED
PLAN OF ABUTMENT AT APPROACH SLAB SEAT
APPROACH SLAB SEAT
BACK FACE OF BREASTWALL
WINGWALL
FREE DRAINING BACKFILL
600
SECTION A-A

File: 366-1

Free Draining Backfill Placement Details

DIVISION 400

ITEM	DESCRIPTION	NUMBER OF PAGES
401	Storm Sewer Pipe	5
404	Precast Catch Basin	2
406	Sluice Box	2
407	Frame With Grate or Cover	1
408	Adjustment of Catch Basins and Manholes	1
409	Relocation of Catch Basin	2
410	Paving Catch Basin Apron	1
415	Pipe Zone Material	2
416	Curb and Gutter	4
419	Concrete Sidewalk	5
420	Asphalt Sidewalk	2
423	Removal of Curb and Gutter	1
424	Removal of Sidewalk	1
425	Removal of Underground Services	2

499 Standard Drawings

401 - 1 Typical Trench Cross Sections
404 - 1 Precast Catch Basin Details
404 - 2 Typical Catch Basin Excavation
406 - 1 Typical Sluice Box and Pipe Detail
406 - 2 Typical Sluice Box Installation Behind the Curb and Gutter
406 - 3 Typical Sluice Box Installation Into the Curb and Gutter
407 - 1 Typical Frame With Grate - Square
407 - 2 Typical Frame With Cover - Round
410 - 1 Paving Catch Basin Apron
416 - 1 Curb and Gutter Details
416 - 2 Curb and Gutter Details
416 - 3 Curb and Gutter Details
419 - 1 Concrete Sidewalk Details
419 - 2 Joint Layout
419 - 3 Joint and Isolation Details
420 - 1 Asphalt Sidewalk Details

401.1 DESCRIPTION

.1 This Item consists of the supply and installation of storm sewer pipe.

401.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Concrete Pipe

- .1 All pipe shall Conform to CAN/CSA-A257.2, Class 65-D.
- .2 All pipe wrap for the pipe joints shall be a geotextile conforming to 601.2, Type N1.

.3 Metal Pipe

- .1 All pipe shall be corrugated steel pipe, as specified by CAN/CSA-G401.
- .2 All pipe wrap for the pipe joints shall be a geotextile conforming to 601.2, Type N1.

.4 Plastic Pipe

- .1 All plastic pipe shall Conform to CAN/CSA-B182.1.
- .2 PVC pipe:
  - .1 Smooth wall PVC pipe shall Conform to CAN/CSA-B182.2, ASTM D3034, and/or ASTM F679.
  - .2 Profile/ribbed PVC pipe shall Conform to CAN/CSA-B182.4 and ASTM F794.
- .3 PE pipe:
  - .1 PE pipe shall Conform to ASTM F405 and/or F667.
  - .2 Profile PE pipe and fittings shall Conform to CAN/CSA-B182.6.
- .4 Specialized Bends:
  - .1 Specialized bends as indicated in the Contract Documents shall Conform to the requirements of the adjoining pipe.

.5 Pipe Zone Materials

- .1 Pipe zone materials shall conform to the limits established in 415.2 or as detailed in the manufacturer's installation instructions.

401.2 .6 Backfill

.1 Backfill material shall be selected material, from the excavation, as approved by the Engineer.

.2 If additional materials are required for backfilling, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer and in accordance with Item 167.

401.3 SUBMITTALS

.1 The Contractor shall submit, in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements as detailed in the Contract Documents.

.2 The Contractor shall notify the Engineer, in writing, for approval of the source(s) of supply of backfill and pipe zone materials, at least 14 Days in advance of obtaining material from the source(s) proposed.

.3 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

401.4 CONSTRUCTION

401.4 .1 General

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Engineer shall provide control points in the field to provide vertical and horizontal control at selected locations or as may be required.

.3 The Contractor shall be responsible for the layout and maintenance of control for all lines and grades for the Work as shown on the Plans.

.4 The Contractor shall schedule all Work to minimize interruptions to existing services.

.5 The Contractor shall notify the Engineer at least 24 hours before inspection of any phase of the Work is anticipated.

401.4 .2 Excavation

.1 Trench excavation for pipe laying shall be carried out in accordance with the limits indicated in the Contract Documents and Standard Drawing 401-1.

.2 The Contractor shall be responsible for the design and construction of all temporary shoring, bracing and underpinning necessary to complete the Work.

401.4.2 .3 The Contractor shall, insofar as is practical, confine his operations and storage of products to the property, rights-of-way or easements provided by the Owner for the Work.

  .1 Any damage resulting from the Work on adjacent property shall be repaired by the Contractor, at his own expense, with reasonable promptness.

  .2 Paved driveways, Culverts, hedges, lawns, etc. which are likely to be affected by the Work are shown on the Plans, and the Contractor shall make the repairs to the affected areas identified as part of this Item.

.4 The Contractor shall neatly cut Pavement in a straight line, so that the excavation does not disturb the surface beyond the limits of the excavation.

  .1 The Contractor shall be responsible, at his own expense, for all removal of, and/or damage to, the Pavement and other surfaces beyond the designated limits of the excavation and for the repair or otherwise restoration of the areas affected.

.5 The Contractor shall dispose of water resulting from the Work in accordance with Item 948 and in a manner not detrimental to public and private property.

.6 The Contractor may be required to excavate existing pipe and/or catch basin(s) in the location of the new pipe alignment.

  .1 The Contractor shall notify the Engineer prior to breaking into existing pipe and catchbasins and shall verify that the existing pipe and catchbasins are out of service and approved for removal.

  .2 Any pipe determined to be salvageable by the Engineer shall remain the property of the Owner and the Contractor shall take all precaution to preserve the pipe sections intact and undamaged.

    .1 If the pipe is damaged as a result of the Contractor's actions, as determined by the Engineer, the Contractor shall be responsible to replace the pipe.

  .3 All pipe removed and salvaged from the Work shall be transported to the nearest DOT Maintenance Depot.

  .4 All unsalvageable pipe and/or catchbasins shall become the property of the Contractor and shall be disposed of outside the Work Site.

.7 The Contractor shall not excavate more than 30 metres in advance of installation operations, without the prior approval of the Engineer.

.8 The Contractor shall not leave open more than 15 metres of trench at the end of any day's operation, without prior approval of the Engineer.

401.4.2 .9 If Overexcavation occurs, the Contractor shall, at his own expense, repair the Overexcavation and shall fill the Overexcavation with an approved backfill material, placed in accordance with Item 936, and compacted to 95% of the maximum dry density.

.10 Rock encountered within the limits of the excavation shall be excavated in accordance with Item 161.

401.4 .3 Pipe Zone Material

.1 Pipe zone material shall be placed as indicated on Standard Drawing 401-1 and in accordance with the pipe manufacturer's instructions.

.2 Pipe zone material shall not be placed in trenches having soft and unstable bottom conditions.

.3 All pipe zone material shall be placed, in accordance with Item 936, in lifts of not more than 150 mm in thickness and compacted to a minimum of 95% of its maximum dry density.

.4 Compaction Equipment for pipe bedding shall be sized so as not to cause damage to the pipe or cause movement of the pipes due to impact and/or vibration.

.5 The Contractor shall shape the pipe bed true to grade and the grade shall provide a continuous, uniform bearing surface for the barrel of the pipe.

.6 All placement of pipe zone material shall be carried out such that the pipe is backfilled equally on both sides at the same time.

401.4 .4 Pipe Laying

.1 All pipe shall be installed on a prepared bed as indicated on Standard Drawing 401-1 and in accordance with 401.4.2.

  .1 In all cases the installation shall proceed upgrade, with the bell ends placed upgrade for concrete and PVC pipe.

  .2 Connections between catch basins and pipe shall be mortared to provide a tight and secure fit.

    .1 Precast inserts shall be acceptable for PVC connections.

401.4 .5 Joints

.1 Joints for concrete and metal pipe storm sewers shall be non-gasketed.

  .1 Joints for concrete and metal pipe shall be wrapped with Type - N1 geotextile for a minimum of 150 mm on each side of the joint and the geotextile shall overlap a minimum of 300 mm at the crown of the pipe.

401.4.5.1 .2 Joints for plastic pipe shall be gasketed.

.3 Joints shall be maintained free of mud, silt, gravel and other foreign materials.

401.4 .6 Backfilling

.1 Backfill material shall be placed from the top of the pipe zone material to the defined Subgrade, as indicated on the Standard Drawing 401-1, and/or as indicated in the Contract Documents.

.2 All backfill material shall be placed, in accordance with Item 936, in lifts of not more than 300 mm in thickness and compacted to a minimum of 95% of its maximum dry density.

.3 Excavated material, suitable for and surplus to backfilling, shall be placed or disposed of by the Contractor as directed by the Engineer.

.4 Excavated material not suitable for backfill, as determined by the Engineer, shall become the property of the Contractor and shall be disposed of outside the Work Site.

401.4 .7 Detours

.1 Detours required for the Work shall be carried out in accordance with Item 918.

401.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of storm sewer pipe supplied and installed in accordance with this Item.

.2 The measurement shall be taken continuously from end to end along the centreline of the pipe starting and ending at the centre of a precast structure (if any) and including in the length any intermediate precast concrete Structures and fittings.

401.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each specified size and type of pipe, as identified under the Contract.

.2 The Owner will make partial payment in accordance with 908.7 for storm sewer pipe stored at the Work Site.

   .1 Partial payment will be made for specialized storm sewer pipe stored at the supplier's yard.

404.1 DESCRIPTION

.1 This Item consists of the supply and installation of precast catch basins.

404.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 All materials shall Conform to CSA A257.4, ASTM C139 and/or ASTM C478M.

.3 Pipe zone materials shall Conform to the limits established in 415.2.

.4 Backfill

  .1 Backfill material shall be selected material from the excavation, as approved by the Engineer.

  .2 If additional materials are required for backfilling, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer and in accordance with Item 167.

404.3 SUBMITTALS

.1 The Contractor shall submit, upon request, in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements as detailed in the Contract Documents.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

404.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall schedule all Work so as to minimize interruptions to existing services.

.3 The height of the precast catch basins, the final grade of the frame and grate, and the location in the Work for each catch basin, shall be as indicated in the Contract Documents.

.4 The Contractor shall be responsible to construct all units in accordance with Standard Drawing 404-1, and all units shall be constructed plumb and true to alignment and grade.

404.4 .5 All joints are to be made watertight using rubber rings, bituminous compound, epoxy resin cement or cement mortar.

.6 The Contractor shall maintain the interior of the unit in a clean condition as the Work progresses.

.7 Holes shall be cut in the precast sections by means of drilling or other methods approved by the Engineer.

  .1 Holes shall not be more than 25 mm greater in diameter than the outside diameter of the connecting pipe.

  .2 Holes may be made at the time of the manufacturing of the precast sections; however, it will be the responsibility of the Contractor to make any adjustments in the field necessary to make the proper connections.

.8 Height adjustments to meet the required elevation shall only be made with precast riser sections and/or metal or concrete grade rings as per Standard Drawing 404-1.

  .1 Precast riser sections will be used if the adjustment to be made is greater than 300 mm.

.9 Excavation, pipe zone material, backfilling around the catch basin installation and any detours required, shall be carried out in accordance with 401.4 and as indicated on the Standard Drawing 404-2.

404.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of precast catch basin, exclusive of frames and grates, supplied and installed in accordance with this Item.

  .1 The height of individual catch basins shall be measured from the underside of the precast concrete base to the underside of the frame or grate seat.

404.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size (diameter) of precast catch basin, as identified under the Contract.

.2 The Owner will make partial payment for precast catch basins in accordance with 908.7.

406.1 DESCRIPTION

.1 This Item consists of the supply and installation of a storm sewer sluice box and drain pipe to the storm sewer pipe, and/or catch basin.

406.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 The sluice box shall be precast concrete fabricated and supplied to the dimensions indicated on Standard Drawing 406-1, complete with drain pipe, steel frame, a square cast iron grate and a pre-cut opening for the drain pipe.

.3 The drain pipe shall be 200 mm diameter PVC pipe meeting the requirements of DR35, typically up to 4.0 m in length.

.4 Pipe zone materials shall Conform to the limits established in 415.2.

.5 Backfill

  .1 Backfill material shall be selected material from the excavation, as approved by the Engineer.

  .2 If additional materials are required for backfilling, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer and in accordance with Item 167.

406.3 SUBMITTALS

.1 The Contractor shall submit, upon request, in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements as detailed in the Contract Documents.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

406.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The sluice box and drain pipe shall be constructed as indicated on Standard Drawing 406-1.

.3 The drain pipe shall be laid on a prepared bed.

.4 The drain pipe from the sluice box shall be connected to the drainage Structure with the end placed flush with the inside surface of the Structure and secured with mortar or a rubber gasket to provide a tight and secure fit.

406.4 .5 Excavation, pipe zone material, backfilling around the sluice box installation shall be carried out in accordance with 401.4.

.6 For installations behind curb and gutter, the sluice box shall be installed with the top grade set at 50 mm below the surrounding ground level as per Standard Drawing 406-2.

.1 The area defined by extending a distance of 600 mm from all sides of the sluice box shall be sloped down from the surrounding grade to the sluice box top grade at a constant Slope.

.7 For installations in the gutter, the sluice box shall be installed with the top grade set at 15 mm below the lowest point of the gutter as per Standard Drawing 406-3.

.1 The area defined by extending a distance of 300 mm from all sides (excluding curbside) of the sluice box, shall be sloped down from the surrounding grade to the sluice box top grade at a constant Slope.

406.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of sluice box units supplied and installed in accordance with this Item.

406.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

407.1 DESCRIPTION

.1 This Item consists of the supply and installation of a catch basin frame with grate or cover.

407.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Frame with grate or cover shall be supplied in accordance with Standard Drawings 407-1 and 407-2 respectively.

407.3 SUBMITTALS

.1 The Contractor shall submit, upon request, in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements as detailed on the Contract Documents.

407.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Frames shall be rigidly fitted onto the drainage Structure.

.3 Frames shall be placed as shown on Standard Drawing 404-1.

.4 Grates or covers shall be set to a tolerance of 0 mm to -12 mm of the adjacent finished elevation.

407.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of catch basin frames with grates or covers supplied and installed in accordance with this Item.

407.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of frame with grate or cover, as identified under the Contract.

408.1 DESCRIPTION

.1 This Item covers the adjustment of catch basins and manholes to the final specified grade.

408.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 All adjusting rings supplied shall be concrete conforming to ASTM C478, high density polyethylene conforming to ASTM D1248 or metal.

408.3 SUBMITTALS

.1 The Contractor shall submit, upon request, in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements as detailed on the Contract Documents.

408.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Existing catch basins and manholes shall be adjusted to suit the final grade and cross slope using grade rings and/or precast riser sections.

.3 Existing cast iron frames shall be removed and cleaned, and prepared for re-use in the Work.

.4 The height of adjustments required shall be set out in the Contract Documents.

.5 The grates or covers shall be set to a tolerance of +0 mm to -12 mm of the adjacent finished elevation.

408.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of catch basins and/or manholes adjusted in accordance with this Item.

408.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

409.1 DESCRIPTION

.1 This Item consists of the relocation of catch basin.

409.2 MATERIALS

.1 Existing catch basin shall be reused.

.2 All materials shall be supplied by the Contractor.

.3 Pipe zone materials shall Conform to the limits established in 415.2 or as detailed in the manufacturer's installation instructions.

.4 Backfill

  .1 Backfill material shall be selected material, from the excavation, as approved by the Engineer.

  .2 If additional materials are required for backfilling, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer and in accordance with Item 167.

409.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

409.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall relocate the existing structure such that it may be reused in the Work.

  .1 The Contractor shall take all precaution to preserve the catch basin intact and undamaged.

  .2 If the catch basin is damaged as a result of the Contractors actions, as determined by the Engineer, the Contractor shall be responsible to replace the catch basin.

.3 Excavation and backfilling of a trench from the catch basin location to the relocation position shall be carried out in accordance with 401.4.

.4 All other Work shall be carried out in accordance with 404.4.

.5 Drain pipe from the existing catch basin shall be relocated by addition or removal of pipe connecting the catch basin and the storm sewer system.

409.4 .6 Drain pipe shall be reconnected to the relocated catch basin and the connection shall be secured with cement mortar.

.7 Relocated catch basins shall be adjusted to suit the specified final grade.

.8 Wall heights shall be adjusted solely by the removal of existing spacer materials and/or by the addition of new or replacement grade rings and/or precast riser sections.

409.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of catch basins relocated in accordance with this Item.

409.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

410.1 DESCRIPTION

.1 This Item consists of the supply and placement of Aggregate Base and asphalt concrete for the construction of an apron around a catch basin grate.

410.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Aggregate Base shall meet the requirements of 201.2.

.3 Asphalt Concrete C or D shall meet the requirements of 260.2.

410.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

410.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Aggregate Base shall be placed and compacted in accordance with 203.4.

.3 The Contractor shall place Asphalt Concrete, over the prepared area surrounding the catch basin, in accordance with 260.4.

.4 The apron shall be shaped as shown on Standard Drawing 410-1.

410.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of catch basin aprons constructed in accordance with this Item.

410.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

415.1 DESCRIPTION

.1 This Item consists of the supply of pipe zone material for all underground services.

415.2 MATERIALS

.1 Pipe zone material shall be clean, hard, sound, durable crushed or pit run gravel or stone, free of shale, clay, friable materials, organic matter and other deleterious substances and shall meet the grading limits indicated in Table 415-1, when tested in accordance with ASTM C136 and ASTM C117.

Table 415-1
Gradation Limits and Uses for Pipe Zone Materials

ASTM Sieve Size	Coarse Material Type A % passing	Fine Material Type B % passing	Bedding Material Type C % passing
For Plastic Pipe **For All Other Pipe**	**> 600 mm ID** **> 450 mm ID**	**≤ 600 mm ID** **≤ 450 mm ID**	**See Note** **See Note**
37.5 mm	100	100	
31.5 mm	95 - 100		
25 mm	81 - 100	95 - 100	100
19 mm	66 - 100	90 - 100	90 - 100
12.5 mm	50 - 90		0 - 90
9.5 mm	41 - 80	60 - 100	0 - 60
4.75 mm	27 - 65	35 - 80	0 - 20
2.36 mm	17 - 50	15 - 60	0 - 8
300 um	4 - 20	0 - 30	
75 um	0 - 8	0 - 10	0 - 3
Note: Type C material may be used for bedding in water problem areas as approved by the Engineer.			

415.3 SUBMITTALS

.1 The Contractor shall submit to the Engineer for approval, at least 14 Days prior to the delivery of the material to the Work Site, the proposed source of supply and certification of the pipe zone material.

415.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

415.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of pipe zone material supplied in accordance with this Item.

415.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of pipe zone material, as identified under the Contract.

416.1 DESCRIPTION

.1 This Item consists of the construction of Portland cement concrete curb and gutter.

416.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Concrete shall be supplied in accordance with 301.2, class of exposure C-2.

.3 Joint filler shall consist of an approved 12 mm thick asphalt impregnated fibreboard of good quality cut to fit the required cross sections of the joints formed.

.1 Alternate materials shall be submitted to the Engineer for approval.

.4 Pigmented membrane curing compounds shall conform to ASTM C309.

.5 Aggregate Base shall meet the requirements of 201.2.

416.3 SUBMITTALS

.1 Submittals are required in accordance with 301.3 and with any other cross-referenced Item forming part of this Item.

416.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Engineer shall provide control points in the field for vertical and horizontal control, at selected locations or as may be required.

.3 The Contractor shall be responsible for the layout for all lines and grades for the Work as indicated in the Contract Documents.

.4 Excavation for the foundation preparation for the curb and gutter shall be to the depth and width as shown in the Contract Documents and/or on Standard Drawing 416-1.

.5 Material disturbed in the bottom of the excavation shall be compacted to the maximum density as determined by a test strip or other standard industry methods, and approved by the Engineer prior to the placement of the backfill.

416.4 .6 Excavated material may be used as backfill behind and under the new concrete curb and gutter along the limits of the Work subject to the approval of the Engineer.

.1 Excavated material, suitable for and surplus to backfilling, shall be disposed of as directed by the Engineer.

.2 Excavated material not suitable for backfill, as determined by the Engineer, shall become the property of the Contractor and shall be disposed of outside the Work Site.

.7 Aggregate Base shall be placed as indicated on Standard Drawings 416-1 and 416-2, and in accordance with 203.4.

.1 Water shall be uniformly applied to the Aggregate Base immediately ahead of concrete placement so as to thoroughly wet the Aggregate Base surface without the pooling of water.

.8 Curb and gutter shall be constructed in accordance with the dimensions shown in the Contract Documents and/or Standard Drawings 416-2 and 416-3.

.1 Joint layout and joint details shall be laid out and constructed in accordance with Standard Drawings 419-2 and 419-3.

.1 Control joints are partial depth and are used to create a plane of weakness in the concrete to control the location of drying shrinkage cracks.

.2 Isolation joints are full depth and are used to prevent cracking due to differential movement.

.3 Construction joints are full depth and are used at the end of a day's construction or when the placement of concrete is interrupted by more than 30 minutes.

.4 Dummy joints are tooled partial depth joints and are positioned for aesthetics.

.9 Concrete shall be placed in accordance with 301.4.

.1 The Contractor shall notify the Engineer at least 24 hours prior to the planned placement of any concrete.

.2 Concrete placed in the Work shall be consolidated to ensure uniformity of the concrete density so that a minimum of voids remain in the placed concrete.

.10 Curb and gutter shall be cast in place in sections of 6 m in length, except in slipforming operations, and/or where local conditions dictate otherwise.

.1 Curb and gutter shall be formed and placed monolithically, without kinks.

.2 Curvatures in the alignment of the curb and gutter for parking areas and at street intersections and transitions for driveways, crosswalks and other transition areas shall be constructed as indicated in the Contract Documents and/or directed by the Engineer.

416.4.10 .3 Where the curb and gutter are formed against a building or other fixed structure, a 12 mm prefabricated joint filler shall be placed between the curb and the adjacent structure, to form an isolation joint as indicated in the Standard Drawing 419-3.

  .1 Spacing of the control joints should vary to coincide with the centre of manholes or other box-outs.

.4 Curb and Gutter shall have a control joint formed by cutting a slot to a depth of 50 mm and spaced as indicated on Standard Drawing 419-2.

.5 Joints shall be cut before uncontrolled shrinkage takes place (which can occur between 4 and 24 hours after placement) and the timing shall be the responsibility of the Contractor.

416.4 .11 Metal Forms

.1 The Contractor shall erect all forms to the full depth of the curb and gutter and these shall be securely positioned to the required lines and grade as indicated in the Contract Documents.

.2 Formwork shall be thoroughly coated with a commercial quality form coating, which will permit the ready release of the forms and will not discolour the concrete.

.3 Forms shall remain in place for a minimum of 24 hours after concrete is placed if the danger of any disturbance to the placed and partially set concrete exists.

.4 Top surfaces of the curb and gutter shall be "struck" with a straight edge and floated with a wooden or magnesium float for finish.

416.4 .12 Slipforming

.1 Slipform machines must be capable of placing the concrete as indicated on Standard Drawings 416-1, 416-2 and 416-3.

  .1 After slipforming, joints shall be saw cut; insert bars will not be permitted.

416.4 .13 Finishing, Curing and Protection

.1 Finished surfaces of the curb and gutter shall be roughened by brooming lightly or other method, subject to the approval of the Engineer.

.2 Pigmented membrane curing compounds may be used, upon request, subject to the prior approval of the Engineer.

  .1 Pigmented membrane curing compounds shall be applied in two applications immediately after the final finishing.

    .1 One application shall be placed in a direction perpendicular to the previous application.

416.4.13 .3 Voids or surface irregularities shall be repaired using concrete grout from the same concrete load and a float shall be used on the repaired area prior to texturing.

.4 Edges of concrete shall be rounded with an approved edging tool while the concrete is still plastic and shall leave a true smooth surface.

.5 The Contractor shall be responsible for the maintenance of the curb and gutter until completion and acceptance of the Work.

416.4 .14 Repair and Replacement

.1 Curb and gutter which does not Conform to the Specifications shall be repaired and/or replaced as directed by the Engineer.

.2 If the repair and replacement results in the need for repairs and adjustments to the materials adjacent to the curb and gutter, the Contractor shall carry out the repairs and adjustments at his own expense and to the satisfaction of the Engineer.

.3 Materials removed shall become the property of the Contractor and shall be disposed of outside the Work Site.

416.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of curb and gutter constructed in accordance with this Item.

416.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of curb and gutter, as identified under the Contract.

419.1 DESCRIPTION

.1 This Item consists of the construction of Portland cement concrete Sidewalk.

419.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Concrete shall be supplied in accordance with 301.2, class of exposure C-2.

.3 The joint filler shall consist of an approved 12 mm thick asphalt impregnated fibreboard of good quality cut to fit the required cross sections of the joints formed.

  .1 Alternate materials shall be submitted to the Engineer for approval.

.4 Pigmented membrane curing compounds shall Conform to ASTM C309.

.5 Aggregate Base shall meet the requirements of 201.2.

419.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

419.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Engineer shall provide control points in the field for vertical and horizontal control at selected locations or as may be required.

.3 The Contractor shall be responsible for the layout for all lines and grades for the Work as indicated in the Contract Documents.

.4 Excavation for the foundation preparation for the Sidewalk shall be to the depth and width as shown in the Contract Documents and/or on Standard Drawing 419-1.

.5 Material disturbed in the bottom of the excavation shall be compacted to the maximum density as determined by a test strip or other standard industry methods, and shall be approved by the Engineer prior to the placement of the backfill.

419.4 .6 Excavated material may be used as backfill behind and under the new concrete Sidewalk along the limits of the Work subject to the approval of the Engineer.

  .1 Excavated material, suitable for and surplus to backfilling, shall be disposed of by the Contractor as directed by the Engineer.

  .2 Excavated material not suitable for backfill, as determined by the Engineer, shall become the property of the Contractor and shall be disposed of outside the Work Site.

.7 Aggregate Base shall be placed as indicated on Standard Drawing 419-1 and in accordance with 203.4.

  .1 Water shall be uniformly applied to the Aggregate Base immediately ahead of concrete placement so as to thoroughly wet the Aggregate Base surface without the pooling of water.

.8 A cross Slope of 20 mm per metre shall be formed and the direction of the Slope shall, in general, be towards the curb, however local conditions may result in the necessity to vary this Slope and the Contractor is to advise the Engineer if this Slope condition must be altered.

.9 Concrete Sidewalk shall be constructed in accordance with the dimensions shown in the Contract Documents and/or Standard Drawing 419-1.

  .1 Joint layout and joint details shall be constructed in accordance with Standard Drawings 419-2 and 419-3.

    .1 Control joints are partial depth and are used to create a plane of weakness in the concrete to control the location of drying shrinkage cracks.

    .2 Isolation joints are full depth and are used to prevent cracking due to differential movement.

    .3 Construction joints are full depth and are used at the end of a Day's construction or when the placement of concrete is interrupted by more than 30 minutes.

    .4 Dummy joints are tooled partial depth joints and are positioned for aesthetics.

.10 Concrete shall be placed in accordance with 301.4.

  .1 The Contractor shall notify the Engineer at least 24 hours prior to the planned placement of any concrete.

  .2 Concrete placed in the Work shall be consolidated to ensure uniformity of the concrete density so that a minimum of voids shall remain in the placed concrete.

416.4 .11 Concrete Sidewalk shall be cast-in-place in 6 m sections in length, except in slipforming operations, and/or where local conditions dictate otherwise.

.1 Sidewalk shall be formed and placed in a single operation.

.2 Curvatures in the alignment of the concrete Sidewalk for parking areas and at street intersections and depressions for driveways, crosswalks and other transition areas shall be constructed as indicated in the Contract Documents and/or as directed by the Engineer.

.3 Where the concrete Sidewalk is formed adjacent to a building or other fixed structure, a 12 mm prefabricated joint filler shall be placed between the curb and the adjacent structure, to form an isolation joint as indicated in the Standard Drawing 419-3.

  .1 Spacing of the control joints should vary to coincide with the centre of manholes or other box-outs.

.4 Concrete Sidewalk shall have a control joint formed by cutting a slot to a depth of 50 mm and spaced as indicated on Standard Drawings 419-2 and 419-3.

.5 Dummy joints shall be formed in concrete at intervals equal to the width of the Sidewalk, by cutting a slot in the slab 25 mm deep with a T-bar.

.6 Every fourth joint shall be to the full depth of the concrete.

.7 Joints shall be cut before uncontrolled shrinkage takes place (which can occur between 4 and 24 hours after placement) and the timing shall be the responsibility of the Contractor.

419.4 .12 Metal Forms

.1 The Contractor shall erect all forms to the full depth of the concrete Sidewalk and these shall be securely positioned to the required lines and grade.

.2 Formwork shall be thoroughly coated with a commercial quality form coating, which will permit the ready release of the forms and will not discolour the concrete.

.3 Forms shall remain in place for a minimum of 24 hours after concrete is placed if the danger of any disturbance to the placed and partially set concrete exists.

419.4 .13 Slipforming

.1 Slipform machines must be capable of placing the concrete as indicated on the Standard Drawing 419-1.

  .1 After slipforming, the joints shall be saw cut; insert bars will not be permitted.

419.4 .14 Finishing, Curing and Protection

.1 The top surface of the Sidewalk shall be "struck" with a straight edge and floated with a wooden or magnesium float for finish.

.2 Finished surfaces of the concrete Sidewalk shall be roughened by brooming lightly or other method, subject to the approval of the Engineer.

.3 Pigmented membrane curing compounds may be used, upon request, subject to the prior approval of the Engineer.

  .1 Pigmented membrane curing compounds shall be applied in two applications immediately after the final finishing.

    .1 One application shall be placed in a direction perpendicular to the previous application.

.4 Voids or surface irregularities shall be repaired using concrete grout from the same concrete load and a float shall be used on the repaired area prior to texturing.

.5 A margin of 50 mm in width shall be defined and finished smooth along the perimeter of each slab and the edges shall be rounded to a radius of 6 mm with an approved edging tool.

.6 The Contractor shall be responsible for the maintenance of the concrete Sidewalk until completion and acceptance of the Work.

419.4 .15 Repair and Replacement

.1 Concrete Sidewalk which does not Conform to the Specifications shall be repaired and/or replaced as directed by the Engineer.

.2 If the repair and replacement results in the need for repairs and adjustments to the materials adjacent to the Sidewalk, the Contractor shall carry out the repairs and adjustments at his own expense and to the satisfaction of the Engineer.

  .1 Materials removed shall become the property of the Contractor and shall be disposed of outside the Work Site.

419.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of Sidewalk constructed in accordance with this Item.

.2 Measurements shall be taken as the dimension of the Work, as indicated on Standard Drawing 419-1 and no deductions shall be made for areas occupied by light standards, manhole covers, poles or other similar objects.

419.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

420.1 DESCRIPTION

.1 This Item consists of the construction of asphalt concrete Sidewalk.

420.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Aggregate Base shall meet to the requirements of 201.2.

.3 Asphalt Concrete D shall conform to the requirements of 260.2.

420.3 SUBMITTALS

.1 The Contractor shall submit the asphalt concrete mix design as set out in 260.2 for approval by the Engineer.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

420.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Asphalt sidewalk shall be constructed as shown on Standard Drawing 420-1.

.3 Material disturbed in the bottom of the excavation shall be compacted to the maximum density as determined by a test strip or other standard industry methods, and approved by the Engineer prior to the placement of the backfill.

.4 Surplus excavated material not required for backfill, as determined by the Engineer, shall become the property of the Contractor and shall be disposed of outside the Work Site.

.5 Aggregate Base shall be placed as indicated on Standard Drawing 420-1, and in accordance with 203.4.

.6 A cross slope of 20 to 30 mm per metre shall be placed and the direction of the Slope shall, in general, be towards the curb, however local conditions may result in the necessity to vary this Slope and the Contractor is to advise the Engineer if this Slope condition must be altered.

.7 The Contractor shall place the sidewalk using an asphalt spreader in accordance with 260.4.

420.4 .8 Asphalt concrete shall be compacted to a density not less than 91% of the theoretical maximum relative density, as determined in accordance with ASTM D2041.

.9 The Contractor shall maintain barricades or other suitable measures to ensure that the finished Sidewalk is protected from traffic until the heat of the asphalt concrete mixture has dissipated.

420.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of asphalt Sidewalk constructed in accordance with this Item.

.2 Measurements shall be taken as the dimension of the Work, as indicated on Standard Drawing 420-1 and no deductions shall be made for areas occupied by light standards, manhole covers, poles or other similar objects.

420.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

423.1 DESCRIPTION

.1 This Item consists of the removal of curb and gutter.

423.2 MATERIALS

.1 None identified.

423.3 SUBMITTALS

.1 None identified.

423.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Excavated curb and gutter materials shall become the property of the Contractor and shall be disposed of outside the Work Site.

423.5 MEASUREMENT FOR PAYMENT

.1 The Quantity measured for payment shall be the number of linear metres of curb and gutter removed in accordance with this Item.

423.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

424.1 DESCRIPTION

.1 This Item consists of the removal of Sidewalk.

424.2 MATERIALS

.1 None identified.

424.3 SUBMITTALS

.1 None identified.

424.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Excavated sidewalk materials shall become the property of the Contractor and shall be disposed of outside the Work Site.

424.5 MEASUREMENT FOR PAYMENT

.1 The Quantity measured for payment shall be the number of square metres of Sidewalk removed in accordance with this Item.

424.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

425.1 DESCRIPTION

.1 This Item consists of the removal of underground services.

425.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Backfill

  .1 Backfill material shall be selected material from the excavation as approved by the Engineer.

  .2 If additional materials are required for backfilling, the Contractor shall import materials to the site from a source and of a type approved by the Engineer and in accordance with the appropriate Item.

425.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

425.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work in accordance with Item 948.

.3 The Contractor shall notify the Engineer prior to breaking into the existing underground services and shall verify that they are out of service and approved for removal.

.4 The Contractor shall be responsible for the design and construction of all temporary shoring, bracing and underpinning found necessary to complete the Work.

.5 The Contractor shall ensure, to the extent practicable, that no contents of any sewer or sewer connection flows into the excavation during the Work.

.6 The Contractor shall confine his operations and storage of products to the properties, rights-of-way or easements provided by the Owner for the Work.

  .1 The Contractor shall repair and restore the properties, rights-of-way or easements provided by the Owner to the satisfaction of the Engineer.

  .2 Any other damage to adjacent property, resulting from the Work, shall be repaired by the Contractor at his own expense.

425.4 .7 Excavation shall be carried out in accordance with 401.4 and Standard Drawings 401-1 and 404-2.

.8 Materials from the Work, unless otherwise determined by the Engineer, shall remain the property of the Owner.

.9 Materials that are determined by the Engineer to be unsalvageable shall become the property of the Contractor and shall be disposed of outside the Work Site.

.10 The Contractor shall completely backfill the excavation resulting from the removal of underground services, with an approved material of the quality matching the surrounding material, and shall finish the backfilled area to match the surrounding grade.

.11 Backfill shall be placed in accordance with Item 936 in lifts of not more than 300 mm in thickness, and compacted to a minimum of 95% of its maximum dry density.

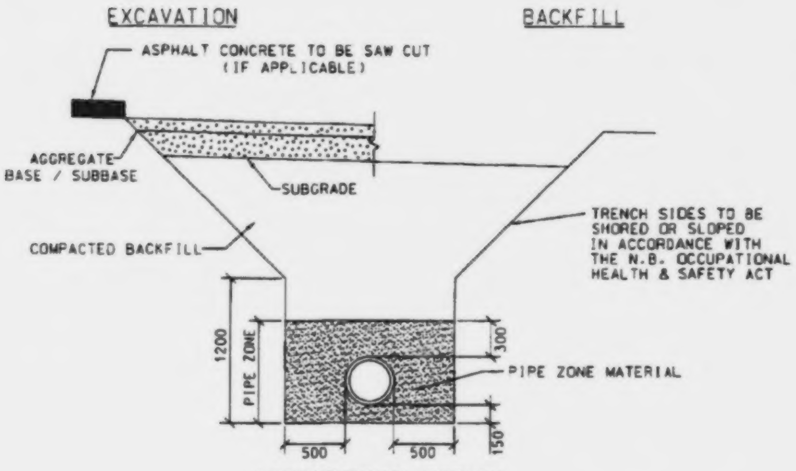
425.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of underground services removed in accordance with this Item.

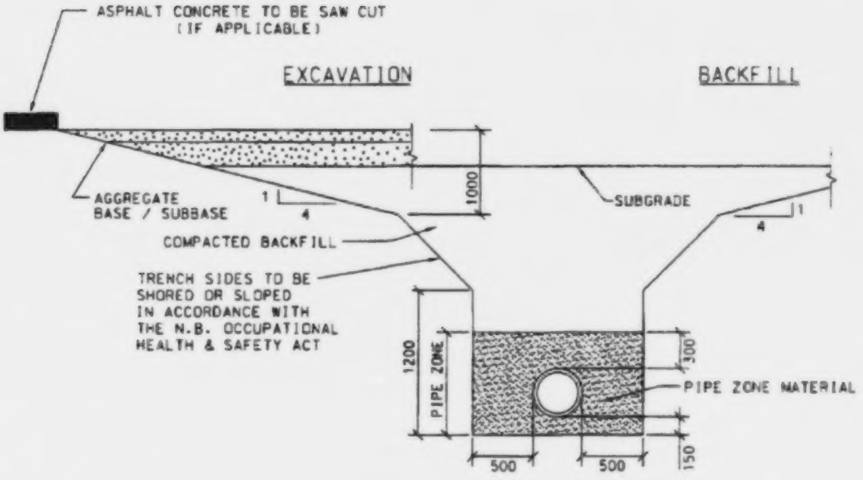
.2 If more than one service exists in a given trench the length shall only be measured once and the combination of services shall be treated as one unit.

425.6 BASIS OF PAYMENT

.1 Payment for Work under this Item include a separate Unit Price for each type of removal of underground services, as identified under the Contract.


EXCAVATION
BACKFILL
ASPHALT CONCRETE TO BE SAW CUT (IF APPLICABLE)
AGGREGATE BASE / SUBBASE
SUBGRADE
COMPACTED BACKFILL
TRENCH SIDES TO BE SHORED OR SLOPED IN ACCORDANCE WITH THE N.B. OCCUPATIONAL HEALTH & SAFETY ACT
1200
PIPE ZONE
300
PIPE ZONE MATERIAL
150
500
500

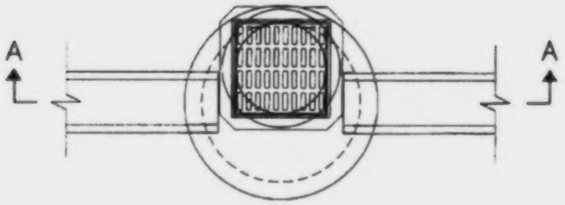
LONGITUDINAL TRENCH


ASPHALT CONCRETE TO BE SAW CUT (IF APPLICABLE)
EXCAVATION
BACKFILL
AGGREGATE BASE / SUBBASE
1
4
1000
SUBGRADE
1
4
COMPACTED BACKFILL
TRENCH SIDES TO BE SHORED OR SLOPED IN ACCORDANCE WITH THE N.B. OCCUPATIONAL HEALTH & SAFETY ACT
1200
PIPE ZONE
300
PIPE ZONE MATERIAL
150
500
500

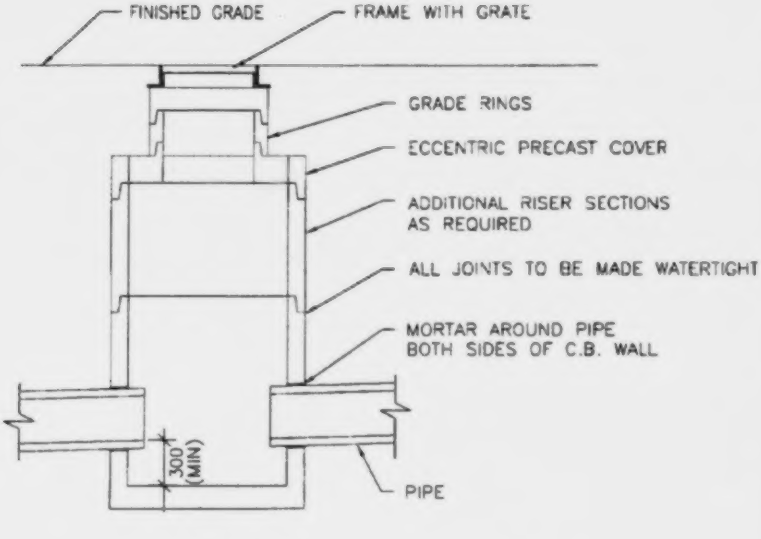
TRANSVERSE TRENCH

File: 401-1

Typical Trench Cross Sections



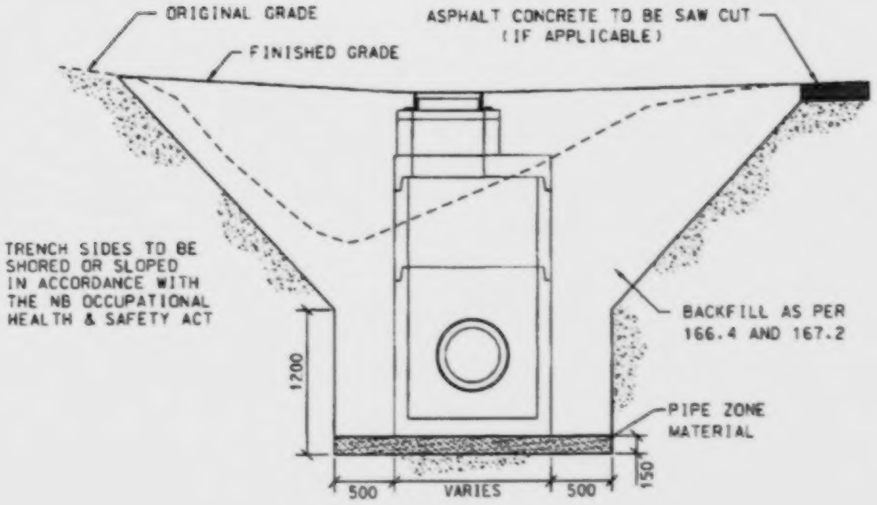
TOP VIEW


FINISHED GRADE
FRAME WITH GRATE
GRADE RINGS
ECCENTRIC PRECAST COVER
ADDITIONAL RISER SECTIONS
AS REQUIRED
ALL JOINTS TO BE MADE WATERTIGHT
MORTAR AROUND PIPE
BOTH SIDES OF C.B. WALL
300
(MIN)
PIPE

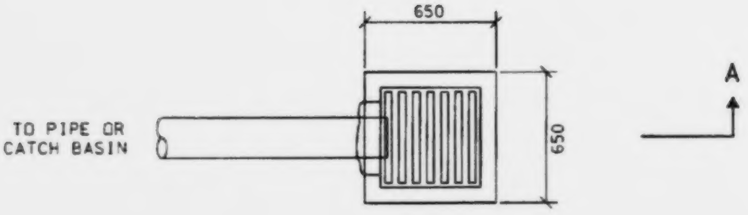
SECTION A–A

Precast Catch Basin Details

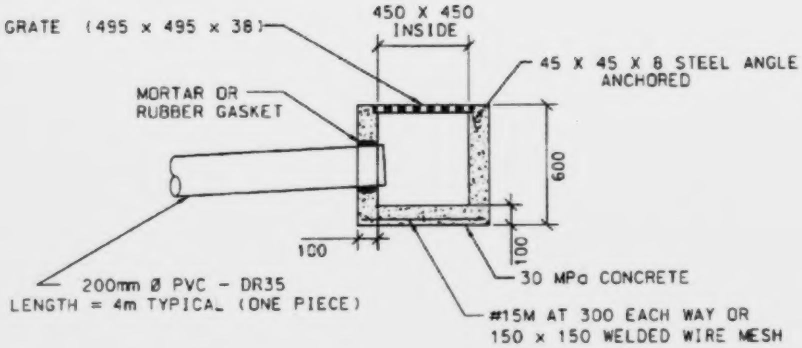
File: 404-1


ORIGINAL GRADE
FINISHED GRADE
ASPHALT CONCRETE TO BE SAW CUT (IF APPLICABLE)
TRENCH SIDES TO BE SHORED OR SLOPED IN ACCORDANCE WITH THE NB OCCUPATIONAL HEALTH & SAFETY ACT
BACKFILL AS PER 166.4 AND 167.2
PIPE ZONE MATERIAL
1200
150
500
VARIES
500

Typical Catch Basin Excavation

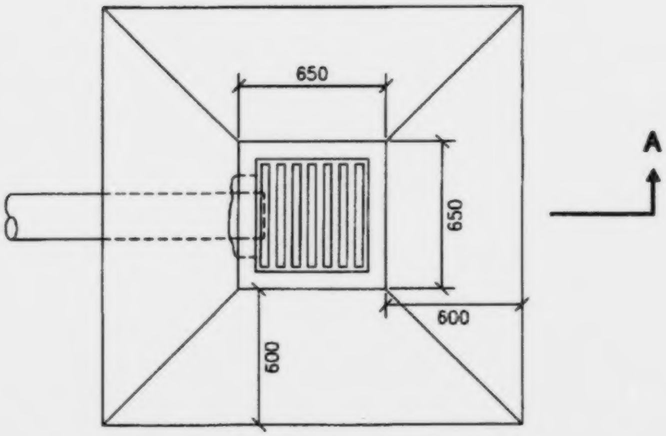

650
TO PIPE OR
CATCH BASIN
650
A

PLAN

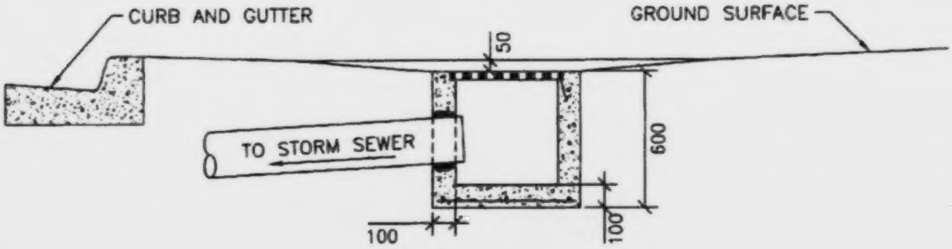

450 X 450
INSIDE
GRATE (495 x 495 x 38)
45 X 45 X 8 STEEL ANGLE
ANCHORED
MORTAR OR
RUBBER GASKET
600
100
100
30 MPa CONCRETE
200mm Ø PVC - DR35
LENGTH = 4m TYPICAL (ONE PIECE)
#15M AT 300 EACH WAY OR
150 x 150 WELDED WIRE MESH

SECTION A

Typical Sluice Box And Pipe Detail

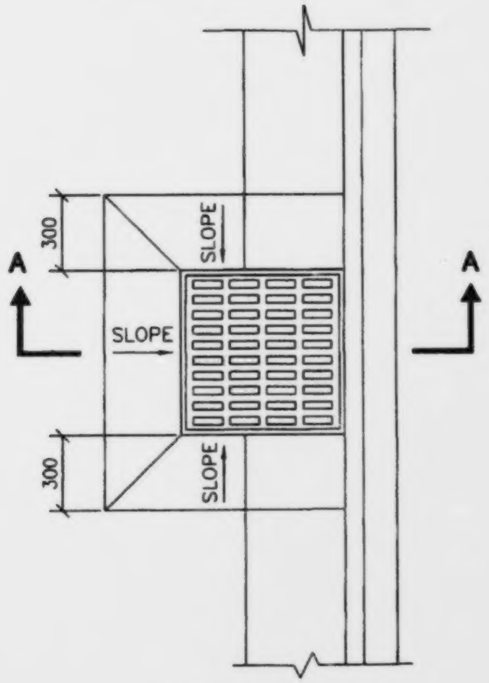

650
650
600
600
A

PLAN

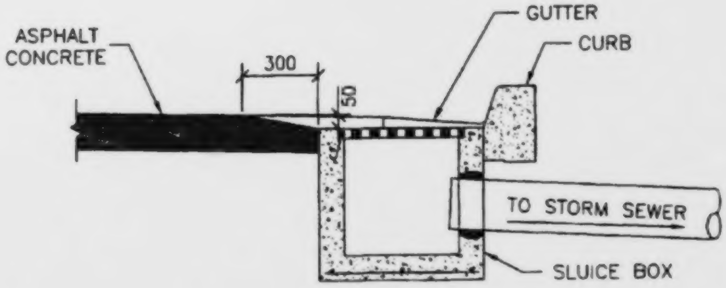

CURB AND GUTTER
GROUND SURFACE
50
TO STORM SEWER
600
100
100

SECTION A

Typical Sluice Box Installation Behind the Curb and Gutter


A
A
300
SLOPE
SLOPE
300
SLOPE

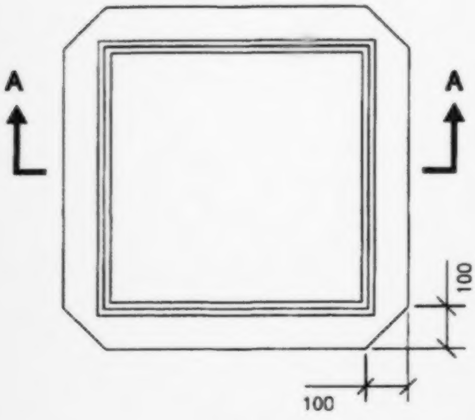
PLAN


ASPHALT CONCRETE
300
50
GUTTER
CURB
TO STORM SEWER
SLUICE BOX

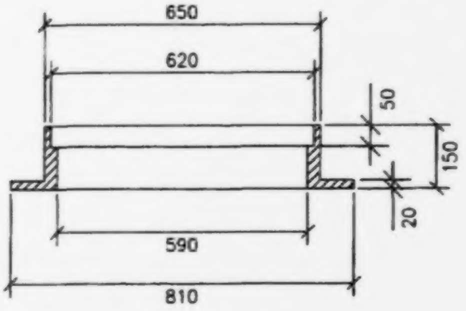
SECTION A–A

Typical Sluice Box Installation Into the Curb and Gutter

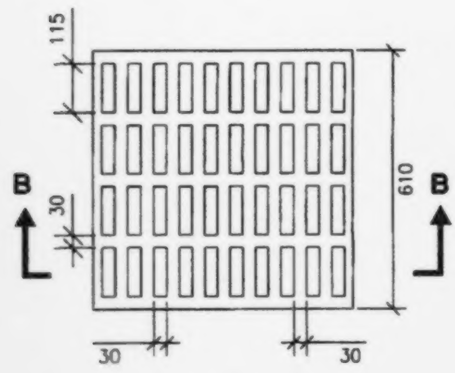
NOTES: – MATERIAL CAST IRON TO
ASTM A48, CLASS 30
– MINIMUM MASS: FRAME 110 kg
GRATE 85 kg



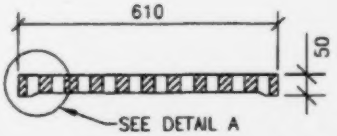
FRAME


650
620
50
150
20
590
810

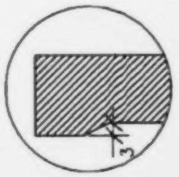
SECTION A–A


115
B
B
30
610
30
30

GRATE


610
50
SEE DETAIL A

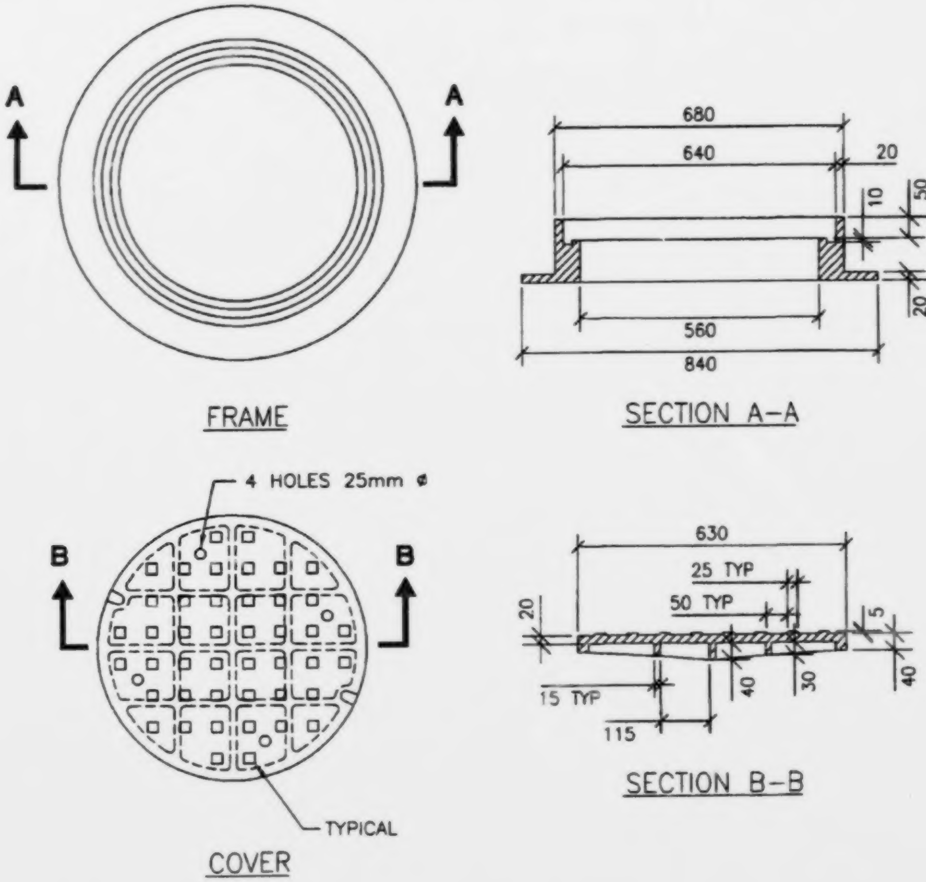
SECTION B–B



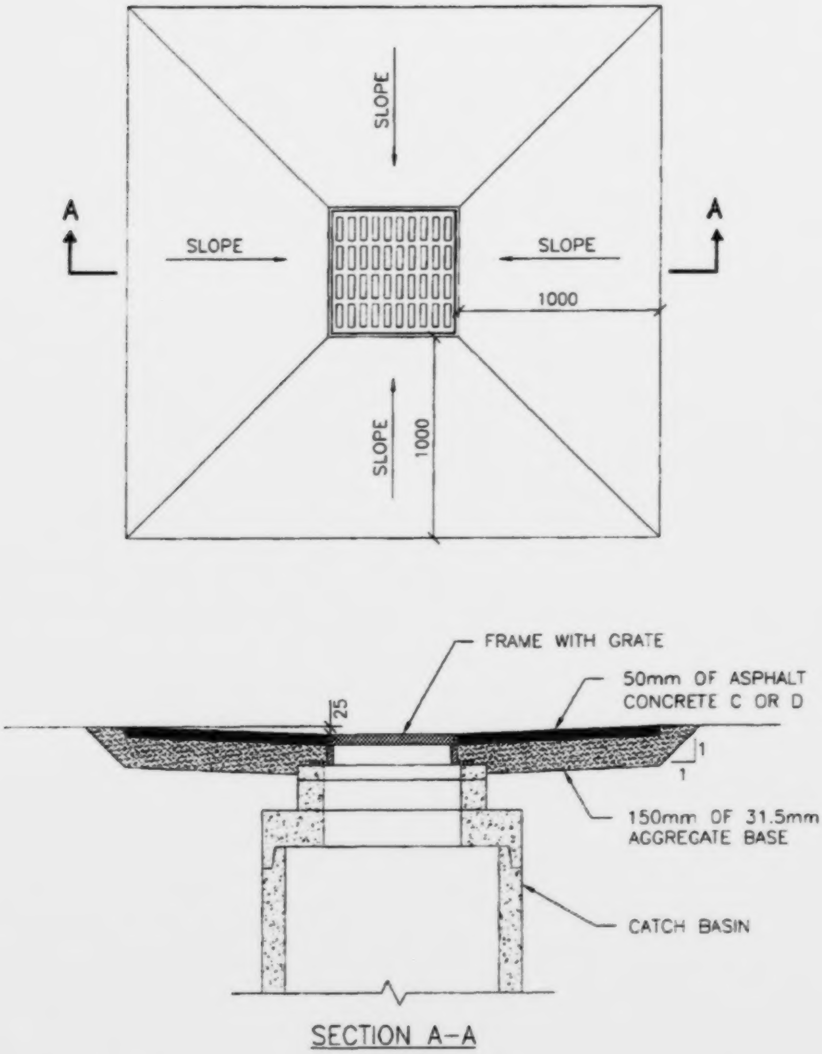
DETAIL A

Typical Frame With Grate
Square

NOTES: - MATERIAL CAST IRON TO
ASTM A48, CLASS 30
- MINIMUM MASS: FRAME 125 kg
COVER 63 kg

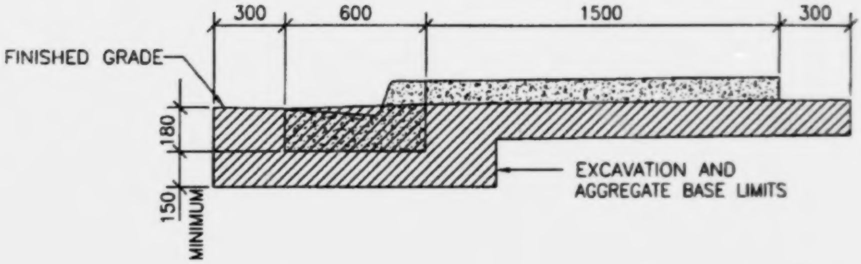

A
A
680
640
20
10
50
150
20
560
840
FRAME
SECTION A-A
4 HOLES 25mm ⌀
B
B
630
25 TYP
50 TYP
20
5
40
30
40
15 TYP
115
TYPICAL
SECTION B-B
COVER

Typical Frame With Cover
Round

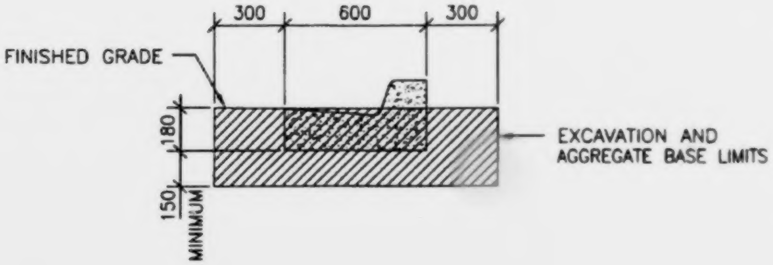

SLOPE
SLOPE
SLOPE
SLOPE
A
A
1000
1000
FRAME WITH GRATE
50mm OF ASPHALT CONCRETE C OR D
25
1
1
150mm OF 31.5mm AGGREGATE BASE
CATCH BASIN
SECTION A-A

File: 410-1

Paving Catch Basin Apron

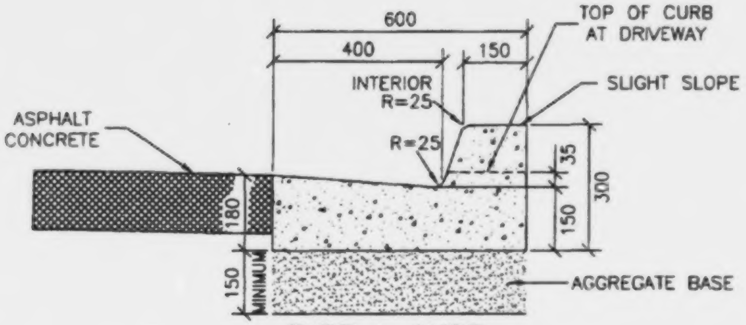

300
600
1500
300
FINISHED GRADE
180
150
MINIMUM
EXCAVATION AND
AGGREGATE BASE LIMITS

CURB AND GUTTER WITH SIDEWALK

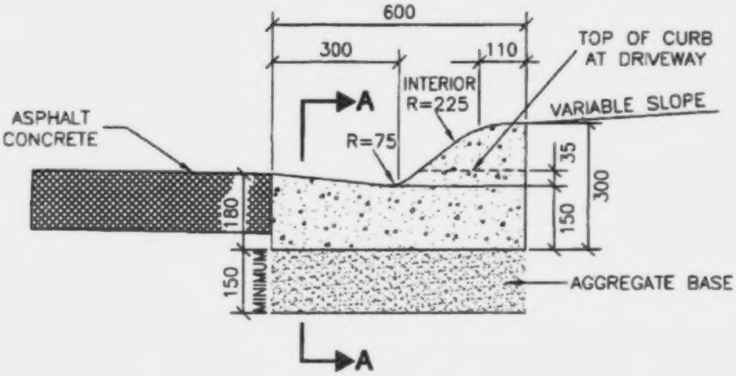

300
600
300
FINISHED GRADE
180
150
MINIMUM
EXCAVATION AND
AGGREGATE BASE LIMITS

CURB AND GUTTER ONLY

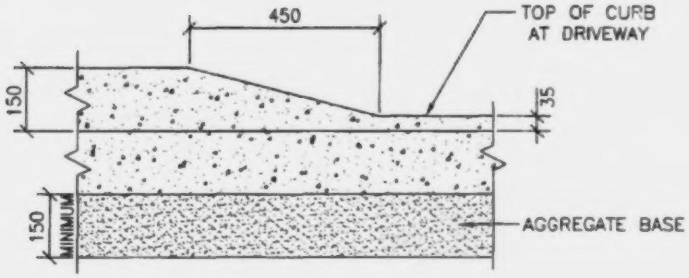
Curb And Gutter Details


600
400
150
TOP OF CURB AT DRIVEWAY
INTERIOR R=25
SLIGHT SLOPE
ASPHALT CONCRETE
R=25
35
300
180
150
150 MINIMUM
AGGREGATE BASE

TYPE A CURB

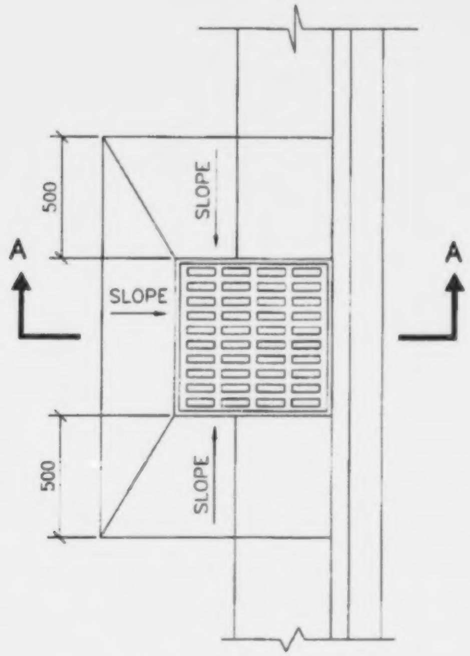

600
300
110
TOP OF CURB AT DRIVEWAY
INTERIOR R=225
A
VARIABLE SLOPE
ASPHALT CONCRETE
R=75
35
300
180
150
150 MINIMUM
AGGREGATE BASE
A

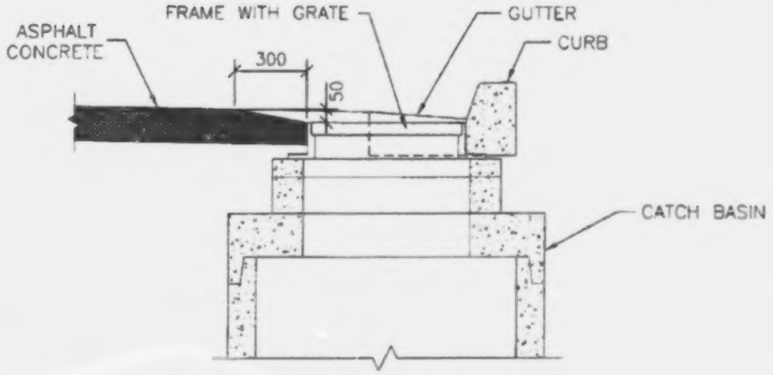
TYPE B CURB


450
TOP OF CURB AT DRIVEWAY
150
35
150 MINIMUM
AGGREGATE BASE

SECTION A–A
TYPICAL TRANSITION – DRIVEWAY OPENING

Curb And Gutter Details

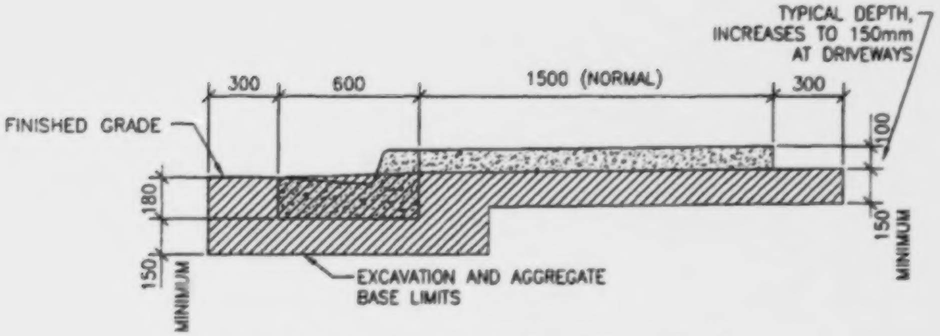

500
SLOPE
A
SLOPE
A
500
SLOPE


ASPHALT CONCRETE
FRAME WITH GRATE
GUTTER
CURB
300
50
CATCH BASIN

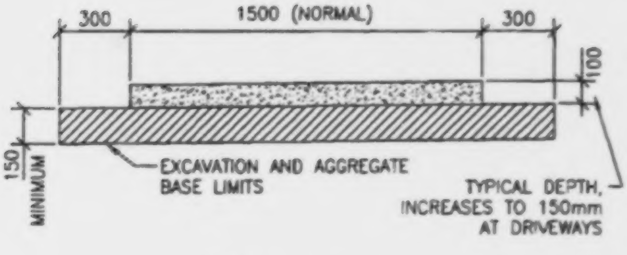
SECTION A-A

File: 416-3

Curb And Gutter Details

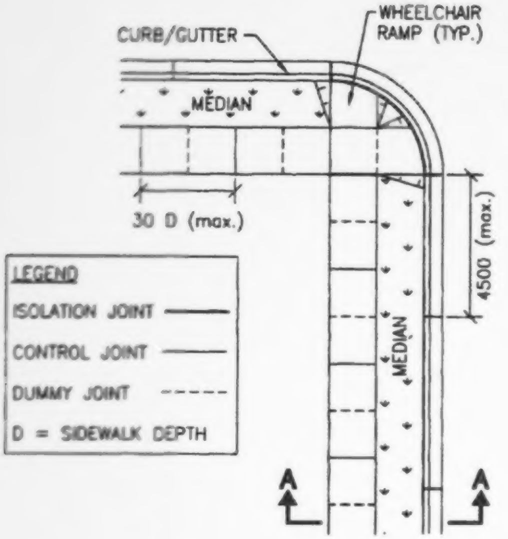

TYPICAL DEPTH, INCREASES TO 150mm AT DRIVEWAYS
300
600
1500 (NORMAL)
300
FINISHED GRADE
100
180
150 MINIMUM
150 MINIMUM
EXCAVATION AND AGGREGATE BASE LIMITS

SIDEWALK WITH CURB AND GUTTER

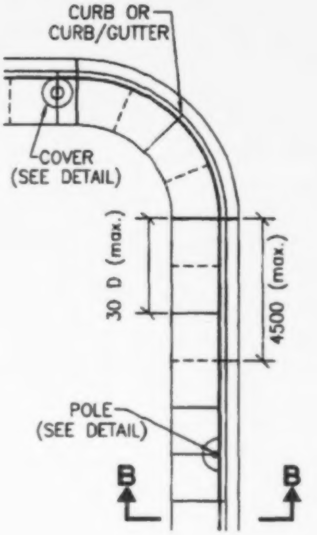

300
1500 (NORMAL)
300
100
150 MINIMUM
EXCAVATION AND AGGREGATE BASE LIMITS
TYPICAL DEPTH, INCREASES TO 150mm AT DRIVEWAYS

SIDEWALK ONLY

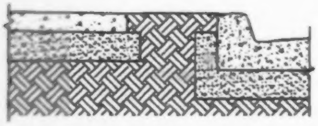
Concrete Sidewalk Details


CURB/GUTTER
WHEELCHAIR RAMP (TYP.)
MEDIAN
30 D (max.)
4500 (max.)
MEDIAN
LEGEND
ISOLATION JOINT
CONTROL JOINT
DUMMY JOINT
D = SIDEWALK DEPTH
A
A

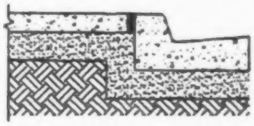
SEPARATE SIDEWALK AND CURB/GUTTER


CURB OR CURB/GUTTER
COVER (SEE DETAIL)
30 D (max.)
4500 (max.)
POLE (SEE DETAIL)
B
B

SIDEWALK WITH CURB/GUTTER

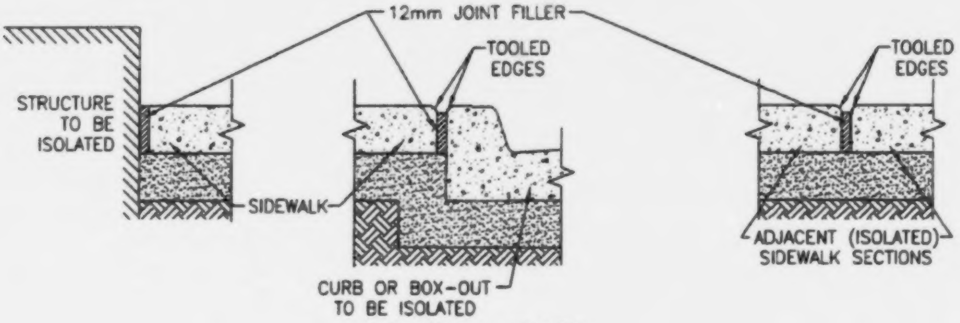


SECTION A–A

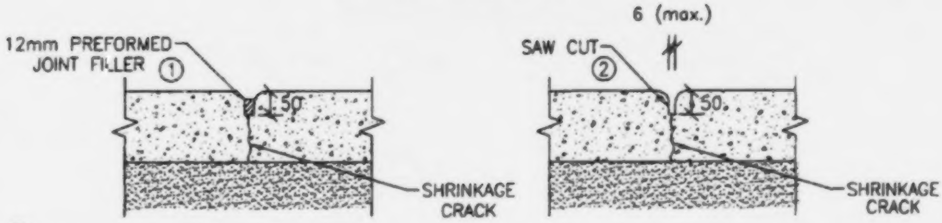


SECTION B–B

Joint Layout


12mm JOINT FILLER
TOOLED EDGES
TOOLED EDGES
STRUCTURE TO BE ISOLATED
SIDEWALK
CURB OR BOX-OUT TO BE ISOLATED
ADJACENT (ISOLATED) SIDEWALK SECTIONS

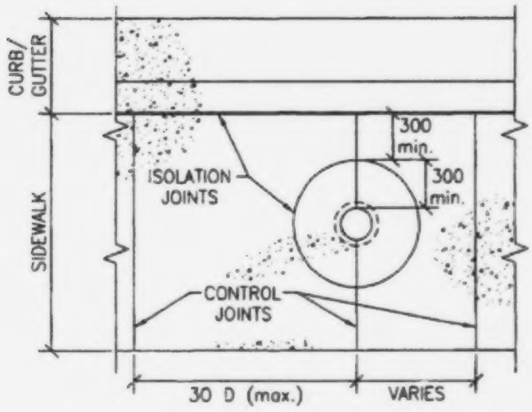
ISOLATION JOINTS

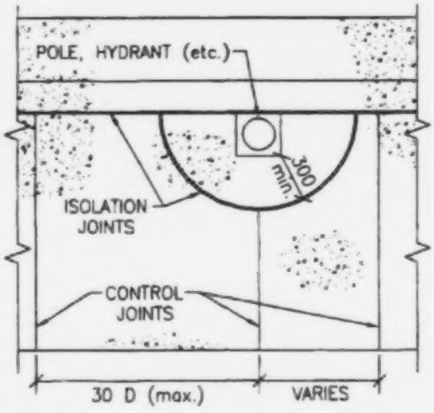

6 (max.)
12mm PREFORMED JOINT FILLER ①
50
SHRINKAGE CRACK
SAW CUT ②
50
SHRINKAGE CRACK

① INSERT JOINT FILLER IN PLASTIC CONCRETE THEN TOOL JOINT

② TOOL JOINT IN PLASTIC CONCRETE, SAW CUT LATER

CONTROL JOINTS


CURB/ GUTTER
SIDEWALK
300 min.
300 min.
ISOLATION JOINTS
CONTROL JOINTS
30 D (max.)
VARIES

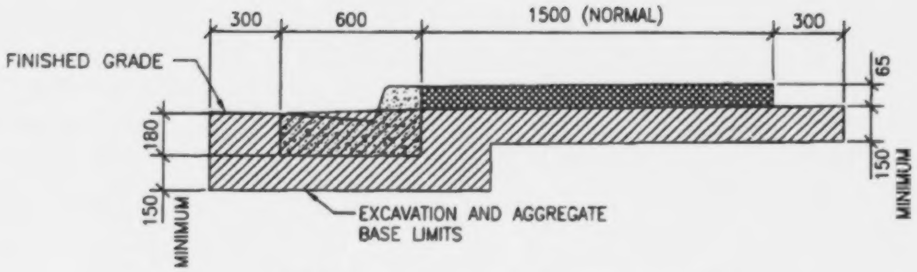

POLE, HYDRANT (etc.)
300 min.
ISOLATION JOINTS
CONTROL JOINTS
30 D (max.)
VARIES

D=SIDEWALK DEPTH

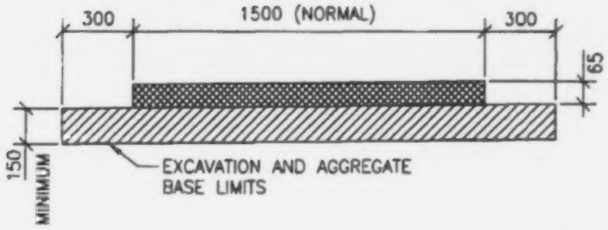
COVER BOX-OUT DETAIL

POLE BOX-OUT DETAIL

Joint and Isolation Details


300
600
1500 (NORMAL)
300
65
FINISHED GRADE
180
150
MINIMUM
150
MINIMUM
EXCAVATION AND AGGREGATE
BASE LIMITS

SIDEWALK WITH CURB AND GUTTER


300
1500 (NORMAL)
300
65
150
MINIMUM
EXCAVATION AND AGGREGATE
BASE LIMITS

SIDEWALK ONLY

Asphalt Sidewalk Details

DIVISION 500

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520	Cast-in-Place Concrete Barrier	3
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531	Underground Duct	3
532	Underground Junction Box	2
533	Power Point	2
534	Removal of Power Point	1
538	Screw Base	1
539	Removal of Screw Base	2
540	Sign or Light Base	2
541	Removal of Sign or Light Base	1
542	Light Standard	2
543	Removal of Light Standard	2
544	Median Flashing Light	2
545	Removal of Median Flashing Light	2
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553	Removal of Roadside Sign	1
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555	Overhead Sign Structure	8
556	Removal of Overhead Sign Structure	1
557	Overhead Sign	1
558	Removal of Overhead Sign	1

599 Standard Drawings

- 510 - 1 Guide Post Details
- 510 - 2 Guide Post and Guide Rail Details
- 512 - 1 Beam Guide Rail Details
- 512 - 2 Guide Rail / Structure Details
- 512 - 3 Guide Rail / Structure Details
- 520 - 1 Cast-in-Place Concrete Barrier Details
- 530 - 1 Under Roadbed Duct Details
- 531 - 1 Underground Duct Details
- 532 - 1 Underground Junction Box Detail
- 533 - 1 Power Point Detail
- 538 - 1 Screw Base Detail
- 540 - 1 Type "E" Sign or Light Base Details - Soil Foundation
- 540 - 2 Type "F" Sign or Light Base Details - Soil Foundation
- 540 - 3 Sign or Light Base Detail - Bedrock Foundation
- 540 - 4 Angulation of Sign Foundations
- 542 - 1 Light Standard Detail - Single and Double Davit
- 542 - 2 Light Standard Wiring Details - 120 v
- 542 - 3 Light Standard Wiring Details - 240 v
- 542 - 4 Light Standard Anchor Details
- 544 - 1 Median Flashing Light Details
- 550 - 1 Roadside Sign Post Anchor Details
- 552 - 1 Roadside Sign Details
- 552 - 2 Roadside Sign Strap Sequence
- 552 - 3 Roadside Sign Strap Sequence
- 552 - 4 Roadside Sign Strap Sequence
- 552 - 5 Roadside Sign Strap Sequence

599 Standard Drawings (Cont'd)

552 - 6 Roadside Sign Strap Sequence
554 - 1 Overhead Sign Structure Foundation - Anchorage Details
554 - 2 Overhead Sign Structure Foundation - Base Plate and Template Details

510.1 DESCRIPTION

.1 This Item consists of the supply and installation of preservative treated hardwood guide posts.

510.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Guide posts shall be of the maple, birch or beech species of hardwood.

.3 The posts shall be sound and rot-free, and shall meet or exceed the requirements for No. 1 Structural Posts and Timbers, graded in accordance with the National Lumber Grading Authority (NLGA) Standard Grading Rules for Canadian Lumber.

.4 Preparation, handling and treatment of posts shall be in accordance with CAN/CSA-080 and the American Wood Preservers' Association (AWPA) standards.

.5 Prior to pressure treating, posts shall be incised on all four sides and dried to their fibre saturation point of 25 to 30% at 25 mm depth.

.6 The preservative shall be as follows: for pressure treating, chromated copper arsenate (CCA); and for field-cut surfaces, Wolman End Cut Preservative (Green) or equivalent applied in two coats.

.7 Preservation and wood products supplied shall be in accordance with CAN/CSA 080.2 and 080.14.

.8 Guide posts shall be sized as indicated on Standard Drawing 510-1.

.9 Backfill materials used shall be selected material from the excavation, subject to the approval of the Engineer.

  .1 If additional materials are required for backfilling, the Contractor shall import materials to the Work Site from a source and of a type approved by the Engineer and supplied in accordance with 167.2 - Class A.

510.3 SUBMITTALS

.1 The Contractor shall submit, upon request, prior to incorporating the material in the Work, the product name and manufacturer's specifications for the preservative to be applied to the post field cuts.

.2 The Contractor shall submit, upon request and in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements as detailed on the Contract Documents.

510.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Guide posts shall be installed in accordance with Standard Drawings 510-1, 510-2, 512-2 and 512-3.

  .1 If Energy-Absorbing Guide Rail Terminal (EAGRT) systems are specified in the Contract Documents, the flared buried end treatments shown in Standard Drawings 510-2 and 512-2 shall be replaced with EAGRT systems installed in accordance with Item 515.

.3 Alignment of guide posts shall be established by the Engineer.

.4 Installation shall be carried out in a manner so as to avoid damage to the adjacent and surrounding Roadway.

  .1 The Contractor shall be responsible, at his own expense, to repair any such damage resulting from the Work.

.5 Areas around guide posts shall be backfilled with approved material, compacted during placement and shall be finished to match the surrounding grade.

.6 Cut surfaces of all wood products shall be treated with an approved preservative, as detailed in the manufacturer's application instructions.

.7 Waste materials shall become the property of the Contractor and shall be disposed of outside the Work Site.

510.5 MEASUREMENT FOR PAYMENT

.1 The Quantity measured for payment shall be the number of guide posts supplied and installed in accordance with this Item.

510.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each size of guide post, as identified under the Contract.

511.1 DESCRIPTION

.1 This Item consists of the removal of guide posts.

511.2 MATERIALS

.1 None identified.

511.3 SUBMITTALS

.1 None identified.

511.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The removal shall be carried out in a manner so as to avoid damage to the adjacent and surrounding Roadway.

  .1 The Contractor shall be responsible, at his own expense, to repair any such damage resulting from the Work.

.3 All materials shall remain the property of the Owner, until such time as the materials are directed for disposal.

  .1 Salvageable guide posts, as determined by the Engineer, shall be used as offset blocks under 512.2, unless otherwise specified in the Contract Documents.

  .2 Salvageable guide posts not used for offset blocks shall be transported to the nearest DOT Maintenance Depot.

  .3 All unsalvageable guide posts and waste shall become the property of the Contractor and shall be disposed of outside the Work Site.

.4 The Contractor shall be responsible to completely backfill the hole resulting from the guide post removal, with an approved material, compacted during placement and shall finish the backfilled area to match the surrounding grade.

.5 The Contractor shall shape and grade the Shoulder by removing the excess materials that have accumulated over time and shall leave the Work Site in a uniform and consistent grade matching the adjacent surface.

511.5 MEASUREMENT FOR PAYMENT

.1 The Quantity measured for payment shall be the number of guide posts removed in accordance with this Item.

511.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

512.1 DESCRIPTION

.1 This Item consists of the supply and installation of steel beam guide rail.

512.2 MATERIALS

.1 Delineators shall be available from the Owner from stock at DOT, Fredericton, NB.

.2 If specified for use on the Contract, salvaged/straightened rail will be made available by the Owner under Item 513 from DOT, Fredericton, NB.

  .1 The Contractor shall be responsible to transport the salvaged rail to the Work Site.

.3 The Contractor shall supply all other materials.

.4 Guide rail shall be Class A, Type II, W-section steel beams Conforming to AASHTO M180.

.5 Offset blocks shall conform with 510.2 and shall be sized in accordance with the details indicated on Standard Drawing 510-1.

512.3 SUBMITTALS

.1 The Contractor shall submit, upon request, prior to incorporating the material in the Work, the product name and manufacturer's specifications for the preservative to be applied to the post field cuts.

.2 The Contractor shall submit, upon request, in advance of the commencement of the Work, the manufacturer's certification, for all galvanized metals, that the materials supplied meet the specified requirements as detailed on the Contract Documents.

512.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Guide rail shall be installed in accordance with Standard Drawings 510-1, 510-2, 512-1, 512-2 and 512-3.

  .1 If Energy-Absorbing Guide Rail Terminal (EAGRT) systems are specified in the Contract Documents, the flared buried end treatments shown in Standard Drawings 510-2 and 512-2 shall be replaced with EAGRT systems installed in accordance with Item 515.

.3 Guide rail sections shall be installed to produce a smooth continuous rail, paralleling the line and grade of the finished Highway surface.

.4 Salvaged guide rail shall not be intermixed or alternated with new guide rail in the same installation.

512.4 .5 Guide rail sections shall be lapped in direction of the traffic.

  .1 Each section of salvaged rail shall be installed such that the end that had been overlapped before dismantling is overlapped upon reinstallation.

  .2 Additional 63 mm x 19 mm slots required in the guide rail shall meet the requirements of AASHTO M180.

.6 Cut surfaces of all wood products shall be treated with an approved preservative, as detailed in the manufacturer's application instructions.

.7 Offset blocks and delineators shall be installed on the guide rail as specified and indicated on Standard Drawing 510-1.

  .1 The colour of the delineator shall be consistent with the colour of the adjacent Pavement line marking.

512.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of guide rail supplied and installed in accordance with this Item.

  .1 The Quantity shall be calculated by multiplying the total number of guide rail pieces in the Work by 3.81 m.

512.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

513.1 DESCRIPTION

.1 This Item consists of the removal of steel beam guide rail.

513.2 MATERIALS

.1 None identified.

513.3 SUBMITTALS

.1 When salvaged guide rail is delivered to the DOT, Fredericton, NB in accordance with 513.4.4 for straightening, the Contractor shall submit a document identifying the quantity of guide rail being delivered and the Contract number of the project under which it was salvaged.

513.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Guide rail, offset blocks, hardware and delineators shall be dismantled to individual components.

.3 The dismantling shall be carried out in a manner so as to avoid damage to the adjacent and surrounding Roadway.

  .1 The Contractor shall be responsible, at his own expense, to repair any such damage resulting from the Work.

.4 Dismantled guide rail, hardware and delineators shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Any loss or damage to materials during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any materials damaged or lost.

  .2 Unsalvageable guide rail, hardware and delineators, as determined by the Engineer, shall become the property of the Contractor and shall be disposed of outside the Work Site.

.5 Dismantled offset blocks shall be stored at a location selected by the Contractor, until reused in the Work and shall be the responsibility of the Contractor.

  .1 Any loss or damage to materials during removal, transporting and/or storage shall be the Contractor's responsibility and he shall replace any materials damaged or lost.

  .2 Unsalvageable offset blocks, as determined by the Engineer, shall become the property of the Contractor and shall be disposed of outside the Work Site.

513.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of guide rail removed in accordance with this Item.

.2 The Quantity shall be calculated by multiplying the total number of guide rail pieces in the Work by 3.81 m.

513.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

515.1 DESCRIPTION

.1 This Item consists of the supply and installation of an Energy-Absorbing Guide Rail Terminal (EAGRT).

515.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 EAGRTs shall meet the requirements of National Cooperative Highway Research Program (NCHRP) Report 350, Test Level 3.

.3 EAGRTs shall be the straight type.

.4 Only proprietary EAGRTs will be acceptable, including those made by the following:

  .1 Energy Absorption Systems Inc., Chicago, Illinois.

  .2 Road System Inc., Big Spring, Texas.

  .3 Trinity Industries Inc., Dallas, Texas.

.5 Posts shall be a steel "breakaway" type designed for the EAGRT to be supplied on the Contract.

.6 A yellow and black hazard marker, minimum 300 mm x 600 mm and made from 3M Hi-Intensity reflective sheeting or equivalent, shall be supplied with each EAGRT.

.7 Backfill material shall be the material excavated from the Roadbed for the installation of the EAGRT, or the material otherwise specified by the manufacturer.

515.3 SUBMITTALS

.1 The Contractor shall submit, at least 14 days in advance of the Work, the type of EAGRT system proposed for the Work, the name of the manufacturer, and at least three copies of Shop Drawings clearly showing in detail the components and installation of the EAGRT.

.2 Prior to delivery of the EAGRT systems to the Work Site, the Contractor shall submit written certification that the EAGRT has been designed to meet the requirements of NCHRP Report 350 Test Level 3; have been fabricated of materials consistent with the design; and will function as designed.

.3 Submittals shall be made as required for any cross-referenced Item forming part of this Item.

515.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Work shall be carried out as indicated in the Shop Drawings.

.3 The Contractor shall be prepared to arrange for a technical representative of the supplier/manufacturer of the EAGRT to be on site for the initial installation on the Contract to ensure that correct procedures are established.

.4 The impact end of each EAGRT may be offset up to 600 mm away from the line of the guide rail installation if the line is not on a horizontal curve, as determined by the Engineer.

.5 The impact head of each EAGRT shall be cleaned thoroughly as recommended by the manufacturer of the reflective sheeting hazard marker.

.6 Hazard markers shall be secured squarely to the impact head.

.7 Backfilling of posts and other underground units of the EAGRT shall be completed in accordance with 510.4.

.8 Installation of any EAGRT shall be performed concurrently with the completion of the guide rail installation to which it will be attached.

515.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment will be the number of EAGRTs installed in accordance with this Item.

515.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

516.1 DESCRIPTION

.1 This Item consists of the removal of an Energy-Absorbing Guide Rail Terminal (EAGRT).

516.2 MATERIALS

.1 None identified.

516.3 SUBMITTALS

.1 None identified.

516.4 CONSTRUCTION

.1 The Contractor shall carry out the Work in accordance with the Contract Documents and/or specifically directed by the Engineer.

.2 Guide rail, offset blocks, steel guide posts, bearing plates, anchors, impact head and all related hardware shall be salvaged and dismantled into individual components.

.3 Dismantling shall be carried out in a manner so as to avoid damage to the adjacent and surrounding Roadway.

  .1 The Contractor shall be responsible, at his own expense, to repair any such damage resulting from the Work.

.4 Dismantled components shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Any loss or damage to components during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any components damaged or lost.

  .2 Unsalvageable components, as determined by the Engineer, shall become the property of the Contractor and shall be disposed of outside the Work Site.

516.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment will be the number of EAGRTs removed in accordance with this Item.

516.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

520.1 DESCRIPTION

.1 This Item consists of the construction of cast-in-place concrete barrier using the slipforming method.

520.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Steel restraining dowels shall meet the requirements of 304.2.

  .1 Dowels shall be of the size and length, as per Standard Drawing 520-1.

.3 Concrete shall be supplied in accordance with 301.2, class of exposure C-2.

.4 Membrane curing compounds shall meet the requirements of ASTM C309 and shall restrict the loss of water to not more than 0.31 kg/m2.

520.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

520.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Concrete barrier shall be constructed in accordance with Standard Drawing 520-1.

.3 Concrete shall be placed in accordance with 301.4.

.4 When slipforming concrete barrier on Aggregate Base, the base shall be fine graded, in accordance with Item 205.

  .1 Water shall be uniformly applied to the Aggregate Base immediately ahead of concrete placement so as to thoroughly wet the Aggregate Base surface without the pooling of water.

.5 When slipforming concrete barrier on Pavement surfaces, the steel dowels shall be installed to the line established by the Engineer.

  .1 Dowels shall be embedded to the depth and at the spacing indicated on Standard Drawing 520-1.

.6 The Contractor shall schedule the Work sequence so as to ensure uniform placement of the concrete with a minimum of interruption.

520.4 .7 The Contractor shall take all precaution to avoid damage to the Roadway surface (Pavement or Aggregate Base) by the slipform paver, truck mixers or other Equipment.

  .1 Concrete spilled on the Highway shall be removed and the Highway cleaned to the satisfaction of the Engineer.

.8 Hand finishing will be permitted only on a minimal basis and shall be conducted with a magnesium or wood float.

  .1 Textured broom or brush finish shall be applied to the approved surface.

  .2 Air holes 15 mm in diameter or larger shall be repaired.

.9 Surfaces of the median barrier shall not vary by more than 5 mm when measured with a 3 m straight edge.

.10 Curing shall consist of two spray applications of the membrane curing compound immediately after finishing with the second application applied in a direction perpendicular to the first.

.11 Contraction joints shall be saw cut, as soon as the concrete has hardened sufficiently to permit sawing without excessive ravelling and before shrinkage cracking takes place.

  .1 Contraction joints shall be cut neatly in a vertical plane to a minimum depth of 50 mm and at a uniform spacing not exceeding 6 m.

.12 Work which experiences uncontrolled shrinkage cracking shall be clearly marked and the Contractor shall notify the Engineer of the location and extent of cracking for his review.

  .1 For those parts deemed not acceptable, the Contractor shall remove and replace a section of concrete of not less than 1 m surrounding the crack.

  .2 The Contractor may submit, for consideration, alternate repair methods.

.13 Vertical construction joints shall include a vertical key in the joint surface.

.14 The Contractor shall undertake formwork and hand placement of the Work where slipforming methods cannot be employed.

  .1 Formwork shall be in accordance with 301.4.

  .2 Form and style of the formed barrier shall match the slipformed abutting section.

520.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of cast-in-place concrete barrier constructed in accordance with this Item.

.2 Measurement of the barrier shall be along the bottom of the barrier, between the end section limits.

520.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

530.1 DESCRIPTION

.1 This Item consists of the supply and installation of duct under the Roadbed.

530.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Electrical equipment shall be certified in accordance with New Brunswick Regulation 84-165 under the Electrical Installation and Inspection Act.

.3 Duct and underground service warning tape shall be of the type and size as indicated on Standard Drawing 530-1.

.4 Backfill material shall be selected materials from the excavation, subject to the approval of the Engineer.

  .1 If additional materials are required for backfilling, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer.

530.3 SUBMITTALS

.1 The Contractor shall submit, in advance of the commencement of the Work, the manufacturer's certification, and/or mill certificates for the duct, that the materials supplied meet the specified requirements as detailed on the Contract Documents.

.2 When requested, the Contractor shall submit the manufacturer's recommended procedures for installation and instructions for handling of the duct.

.3 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

530.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Construction of the trench and the installation of the duct shall be in accordance with Standard Drawing 530-1, and/or as indicated in the Contract Documents.

  .1 For excavation depths greater than 1.5 m, the Contractor shall notify the Engineer of the schedule of the Work.

530.4 .3 Bottom of the excavated trenches shall be uniformly graded and shall be free of sharp rocks or disturbed ground.

  .1 If Overexcavation is carried out, the Contractor shall, at his own expense, repair the area of Overexcavation and shall fill this area with an approved backfill material placed in accordance with Item 936, and compacted to a minimum of 95% of the maximum dry density.

.4 The Contractor shall install the duct in the prepared trench such that the duct is free of sharp bends, kinks and breaks.

  .1 Joints shall be watertight.

.5 Duct installation shall be inspected and approved by the Engineer prior to backfilling.

.6 Trenches shall be completely backfilled to Subgrade elevation.

  .1 Backfill shall be placed in such a manner so as to minimize damage to the installed duct.

  .2 Backfill for the area immediately surrounding the duct and to a height of 75 mm above the conduit shall be non-organic and free of lumps and stones larger than 50 mm in the greatest dimension.

  .3 Backfill from 75 mm above the duct to Subgrade shall be material of the quality matching the surrounding material.

  .4 Backfill shall be compacted to the degree of compaction of the existing surrounding material or, as a minimum, in lieu of other direction, in accordance with Item 936, to a minimum of 95% of the maximum dry density.

.7 Backfill and materials above Subgrade elevation shall match the surrounding existing Pavement Structure.

.8 Underground service warning tape shall be installed to conform to the details shown on Standard Drawing 530-1.

.9 After the backfilling is complete, a mandrel with a diameter of at least 90% of the diameter of the installed duct shall be passed through the length of the duct system in the presence of the Engineer.

  .1 The Contractor shall be responsible to clear and/or replace any ducts that do not pass the mandrel test.

.10 Immediately after the mandrel inspection and approval, the Contractor shall securely block the open ends of the duct with a watertight plug.

.11 The Contractor shall install a visible marker at each end (termination point) of the under Roadbed duct crossing.

530.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of duct supplied and installed in accordance with this Item.

530.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

531.1 DESCRIPTION

.1 This Item consists of the supply and installation of duct and wires.

531.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Electrical equipment shall be certified in accordance with New Brunswick Regulation 84-165 under the Electrical Installation and Inspection Act.

.3 Duct, secondary wires, ground wires, ground rods, underground service warning tape and connections shall be of the type and size as indicated on Standard Drawing 531-1.

.4 Backfill materials shall be selected material from the excavation, subject to the approval of the Engineer.

  .1 If additional materials are required for backfilling, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer.

531.3 SUBMITTALS

.1 The Contractor shall submit, in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements as detailed on the Contract Documents.

.2 Prior to commencing the Work, the Contractor shall submit a copy of the wiring permit to the Engineer.

.3 When requested, the Contractor shall submit the manufacturer's recommended procedures for installation and instructions for handling of the duct.

.4 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

531.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Electrical Work shall be in accordance with the Canadian Electrical Code.

.3 On new construction the Work under this Item shall be completed before Aggregate Subbase placement.

.4 Construction of the trench and the installation of the duct and the wiring shall be in accordance with Standard Drawing 531-1.

531.4.4 .1 Bottom of the excavated trenches shall be undisturbed insitu soil and shall have a uniform grade, free of sharp rocks.

.2 If Overexcavation is carried out, the Contractor shall, at his own expense, repair the area of Overexcavation and shall fill this area with an approved backfill material placed in accordance with Item 936, and compacted to a minimum of 95% of the maximum dry density.

.5 Duct placed under a Roadbed shall be encased in Under Roadbed Duct.

.6 The Contractor shall install the duct in the prepared trench such that the duct is free of sharp bends, kinks and breaks.

.7 Duct shall be inspected and approved by the Engineer prior to backfilling.

.8 Backfill shall be placed in such a manner so as to minimize damage to the installed duct.

.9 Trenches shall be completely backfilled and finished level with the surrounding adjacent surface.

.1 For trenches outside the Roadbed, backfill shall be tamped during placement.

.1 Backfill in the area immediately surrounding the duct, and to a height of 75 mm above the conduit, and also in the top 300 mm of the trench, shall be in-organic and free of lumps and stones larger than 50 mm in the greatest dimension.

.2 For trenches within the Roadbed, backfilling shall be carried out as follows:

.1 Backfill for the area immediately surrounding the duct and to a height of 75 mm above the conduit shall be in-organic and free of lumps and stones larger than 50 mm in the greatest dimension.

.2 Backfill from 75 mm above the duct to Subgrade shall be material of the quality matching the surrounding material.

.3 Backfill shall be compacted to the degree of compaction of the existing surrounding material or, as a minimum, in lieu of other direction, in accordance with Item 936, to a minimum of 95% of the maximum dry density.

.4 Backfill and materials above Subgrade shall match the surrounding existing Pavement Structure.

.10 Underground service warning tape shall be installed to conform to the details shown on Standard Drawing 531-1.

531.4 .11 After the backfilling is complete, a mandrel with a diameter of at least 90% of the diameter of the installed duct shall be passed through the length of the duct system in the presence of the Engineer.

.1 The Contractor shall be responsible, to clear and/or replace any ducts that do not pass the mandrel test.

.12 Immediately after the mandrel inspection and approval, the Contractor shall securely block the open ends of the duct with a watertight plug.

.13 Secondary wires shall be of a size and number indicated on the Plans.

.1 The Contractor shall pull the wires through the duct in such a manner that no damage will occur to the wire as a result of installation.

.14 A minimum of 1 m of secondary and ground wire shall be left coiled at all pole bases, junction boxes and power points in order to accommodate the making of connections.

.15 Splicing of wire will only be permitted in junction boxes.

.16 Electrical Work shall be tested for satisfactory operation by the Contractor and the results of the tests shall be submitted to the Engineer.

.17 The Contractor shall perform megger tests on all feeders and branch circuits before energizing any portion of the electrical system.

531.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of duct and wires supplied and installed in accordance with this Item.

.2 Linear measurement shall be taken from end to end on the duct and shall be measured along the direct run of the duct.

.1 Duct encased in Under Roadbed Duct shall be measured as one unit of length.

531.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of installation, as identified under the Contract.

532.1 DESCRIPTION

.1 This Item consists of the supply and installation of an underground electrical junction box.

532.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 The underground electrical junction box shall be of the type and size as indicated on Standard Drawing 532-1.

.3 All electrical equipment shall be certified in accordance with New Brunswick Regulation 84-165 under the Electrical Installation and Inspection Act.

.4 Free-draining backfill shall be supplied in accordance with 366.2.

.5 Backfill material shall be selected materials from the excavation, subject to the approval of the Engineer.

  .1 If additional materials are required for backfilling, the Contractor shall import materials to the Work Site from a source and of a type approved by the Engineer and in accordance with 167.2.

532.3 SUBMITTALS

.1 The Contractor shall submit, in advance of the commencement of the Work, the manufacturer's certification that the materials supplied meet the specified requirements as detailed on the Contract Documents.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

532.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All electrical Work shall be in accordance with the Canadian Electrical Code.

.3 The junction box shall be installed in accordance with Standard Drawing 532-1.

  .1 All wire splices inside the junction box shall be made with a CSA-approved direct buried splice kit.

532.4 .4 The Work shall be carried out in a manner so as to avoid damage to the adjacent and surrounding Roadway.

.1 The Contractor shall be responsible, at his own expense, to repair any such damage resulting from the Work.

.5 The junction box shall be installed above the water table on a 400 mm thick foundation layer of free draining backfill.

.1 The foundation layer shall be constructed such that the area is maintained free-draining and the area of the junction box installation shall be provided with positive drainage to ensure that water cannot pond or saturate the foundation zone.

.6 The top of the junction box shall be placed flush with the surrounding grade, either existing or adjusted to accommodate 532.4.5.

.7 All backfill shall be placed in accordance with 166.4.

532.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of underground junction boxes supplied and installed in accordance with this Item.

532.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

533.1 DESCRIPTION

.1 This Item consists of the installation of a power point.

533.2 MATERIALS

.1 The control box and service box shall be available from the Owner at DOT Fredericton, NB.

.2 All other materials shall be supplied by the Contractor.

.3 All electrical equipment shall be certified in accordance with New Brunswick Regulation 84-165 under the Electrical Installation and Inspection Act.

533.3 SUBMITTALS

.1 Prior to commencing the Work, the Contractor shall submit a copy of the wiring permit to the Engineer.

533.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All electrical Work shall be in accordance with the Canadian Electrical Code.

.3 The power point shall be installed in accordance with Standard Drawing 533-1.

.4 The Contractor shall be responsible for transporting, unloading, storing and distributing materials from DOT, Fredericton, to the Work Area(s).

.5 The Contractor shall be responsible for all materials and for any damage or loss from the time of receipt of the materials until such time that the materials have been accepted in the Work.

.6 All electrical wiring shall be connected as shown on the Plans.

  .1 All portions of the electrical Work shall be tested for satisfactory operation and the results of the tests shall be submitted to the Engineer.

  .2 The Contractor shall perform megger tests on all feeders and branch circuits before energizing any portion of the electrical system.

.7 The control box and service box shall be locked immediately after installation and the keys shall be delivered to the Engineer.

533.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of power points installed in accordance with this Item.

533.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

REMOVAL OF POWER POINT ITEM: 534

534.1 DESCRIPTION

.1 This Item consists of the removal of a power point.

534.2 MATERIALS

.1 None identified.

534.3 SUBMITTALS

.1 Prior to commencing the Work, the Contractor shall submit a copy of the wiring permit to the Engineer.

534.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All electrical Work shall be in accordance with the Canadian Electrical Code.

.3 A power point shall consist of all components as identified and detailed on Standard Drawing 533-1.

.4 The Contractor shall remove the above ground conduit, wire, control box, service box and photo control unit from the Utility pole and the wire from the Utility pole to the next junction point(s).

  .1 The Utility Pole shall only be removed if the electrical supply feeds only the DOT control box.

.6 Power point and all components shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Any loss or damage to materials during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any materials damaged or lost.

534.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of power points removed in accordance with this Item.

534.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

538.1 DESCRIPTION

.1 This Item consists of the installation of a screw base.

538.2 MATERIALS

.1 Screw bases, bolts and washers shall be available from the Owner at DOT, Fredericton, NB.

.2 All other materials shall be supplied by the Contractor.

538.3 SUBMITTALS

.1 None identified.

538.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Screw bases shall be installed at the locations indicated on the Plans.

.3 Screw bases shall be aligned to be within ± 25 mm in horizontal offset from the centrelines as shown on Standard Drawing 538-1.

.4 The top surface of the screw bases shall be within the following tolerances:

  .1 ± 3 mm of a level line when measured across the top surface of the base.

  .2 ± 25 mm of the elevation provided by the Engineer.

538.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of screw bases installed in accordance with this Item.

538.6 BASIS OF PAYMENT

.1 Payment for work under this Item shall be at the Unit Price.

539.1 DESCRIPTION

.1 This Item consists of the removal of a screw base.

539.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 The backfill materials shall be selected materials from the Work Site, subject to the approval of the Engineer.

  .1 If additional materials are required for backfill, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer.

539.3 SUBMITTALS

.1 None identified.

539.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Work shall be carried out in such a manner so as to avoid damage to the screw base and its components.

.3 Screw base, bolts and washers shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Any loss or damage to materials during removal, transporting and/or storage shall be the Contractor's responsibility and he shall replace any materials lost or damaged.

  .2 All material that is not a component of the screw base shall be removed from the screw base.

.4 The Contractor shall be responsible to completely backfill the hole resulting from the removal of the screw base with an approved material, compacted during placement, and finished to match the surrounding grade.

539.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of screw bases removed in accordance with this Item.

539.6 BASIS OF PAYMENT

.1 Payment for work under this Item shall be at the Unit Price.

540.1 DESCRIPTION

.1 This Item consists of the construction of a cast-in-place reinforced concrete sign or light base.

540.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Electrical equipment shall be certified in accordance with New Brunswick Regulation 84-165 under the Electrical Installation and Inspection Act.

.3 Concrete shall be supplied in accordance with 301.2, class of exposure F-1.

.4 Reinforcing steel shall meet the requirements of 304.2.

.5 Other materials are detailed on the Standard Drawings 540-1, 540-2 and 540-3.

.6 Backfill material shall be selected materials from the excavation, subject to the approval of the Engineer.

    .1 If additional materials are required for backfilling, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer and supplied in accordance with 167.2.

540.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

540.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Electrical Work shall be in accordance with the Canadian Electrical Code.

.3 Construction of all sign and light bases shall be in accordance with the details indicated on Standard Drawings 540-1, 540-2, 540-3 and 540-4.

.4 Bases shall not have a diameter variation greater than 20 mm in the cross sectional dimensions.

.5 The anchor bolt assembly shall be aligned to be within ± 25 mm in horizontal offset from the centrelines as shown on Standard Drawing 540-4.

.6 Concrete and reinforcing steel shall be placed to meet the requirements of 301.4 and 304.4, respectively.

540.4 .7 Backfilling shall be carried out in accordance with 166.4.

.8 Bases shall have the top surface finished level, smooth and within the following tolerances:

.1 ± 3 mm of a level line when measured across the base;

.2 ± 25 mm of the elevation provided by the Engineer.

540.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of bases constructed in accordance with this Item.

540.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of base, as identified under the Contract.

541.1 DESCRIPTION

.1 This Item consists of the removal of a concrete sign or light base.

541.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Backfill materials shall be selected materials from the excavation, subject to the approval of the Engineer.

  .1 If additional materials are required for backfill, the Contractor shall import materials to the Work Area from a source and of a type approved by the Engineer.

541.3 SUBMITTALS

.1 None identified.

541.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Work shall be carried out in such a manner so as to avoid damage to the sign or light base and its components.

  .1 Any salvageable bases not reused on the Contract shall be transported to the nearest DOT District Maintenance Depot.

  .2 Unsalvageable bases shall become the property of the Contractor and shall be disposed of outside the Work Site.

.3 The Contractor shall be responsible to completely backfill the hole resulting from the removal of the base with an approved material, compacted during placement, and finished to match the surrounding grade.

541.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of bases removed in accordance with this Item.

541.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of base, as identified under the Contract.

542.1 DESCRIPTION

.1 This Item consists of the installation of a light standard and luminaires.

542.2 MATERIALS

.1 Light standard (pole and davit), luminaires, lamps, complete panel boards, fuse kits and pole hardware shall be available from the Owner at DOT Fredericton, NB.

.2 All other materials required shall be supplied by the Contractor.

.3 All electrical equipment shall be certified in accordance with New Brunswick Regulation 84-165 under the Electrical Installation and Inspection Act.

542.3 SUBMITTALS

.1 Prior to commencing the Work, the Contractor shall submit a copy of the wiring permit to the Engineer.

542.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All electrical installations shall be in accordance with the Canadian Electrical Code.

.3 The Contractor shall be responsible for transporting, unloading, storing and distributing materials from DOT, Fredericton, to the Work Area(s).

.4 The Contractor shall be responsible for all materials and for any damage or loss from the time of receipt of any materials until such time that the materials have been accepted in the Work.

.5 The wiring shall be installed and the complete structure erected, plumbed and connected to the underground wiring, in accordance with Standard Drawings 542-1, 542-2, 542-3 and 542-4.

  .1 Wire splices will not be permitted between the handhole connections and the luminaire.

.6 The Contractor shall perform megger tests on all feeders and branch circuits before energizing any portion of the electrical system.

.7 Luminaires with lamps shall be attached to the light standard and the unit shall be made operational.

.8 The luminaires once operable shall be adjusted by the Contractor under the direction of the Engineer.

542.4 .9 All portions of the electrical Work shall be tested for satisfactory operation and the results shall be submitted to the Engineer.

542.5 MEASUREMENT FOR PAYMENT

.1 The Quantity measured for payment shall be the number of light standards installed in accordance with this Item.

542.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

REMOVAL OF LIGHT STANDARD

ITEM: 543

543.1 DESCRIPTION

.1 This item consists of disconnecting and removing light standard(s) and luminaires.

543.2 MATERIALS

.1 None identified.

543.3 SUBMITTALS

.1 Prior to commencing the Work, the Contractor shall submit a copy of the wiring permit to the Engineer.

543.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Electrical Work shall be in accordance with the Canadian Electrical Code.

  .1 Electrical equipment shall be removed in accordance with New Brunswick Regulation 84-165 (Electrical Installation and Inspection Act).

.3 Work shall be carried out in such a manner so as to avoid damage to the light standard and its components.

  .1 The Contractor shall be responsible, at his own expense, for any repair of such damage resulting from this Work.

.4 Light standards and components shall be handled with a non-metallic sling.

.5 Light standards shall be removed from the concrete base and disassembled into davit, pole and luminaire(s).

.6 Wire shall be rolled and labelled by length.

.7 Light standards, luminaires and wire shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Any loss or damage to materials during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any materials damaged or lost.

543.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of light standards removed in accordance with this Item.

543.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

544.1 DESCRIPTION

.1 This Item consists of the installation of a median flashing light with post.

544.2 MATERIALS

.1 The median flashing light, post and mounting hardware shall be available from the Owner at DOT, Fredericton, NB.

.2 All other materials shall be supplied by the Contractor.

.3 All electrical equipment shall be certified in accordance with New Brunswick Regulation 84-165 under the Electrical Installation and Inspection Act.

544.3 SUBMITTALS

.1 Prior to commencing the Work, the Contractor shall submit a copy of the wiring permit to the Engineer.

544.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 All electrical installations shall be in accordance with the Canadian Electrical Code.

.3 The median flashing light and post shall be installed on the concrete median barrier or screw foundation as shown on Standard Drawing 544-1.

.4 The Contractor shall be responsible for transporting, unloading, storing and distributing materials from DOT Fredericton to the Work Area(s).

.5 The Contractor shall be responsible for all materials and for any damage or loss from the time of receipt of the materials until such time that the materials have been accepted in the Work.

.6 All wiring connections shall be carried out, by the Contractor, to make the light operational.

  .1 Wire splices will not be permitted.

.7 All portions of the electrical Work shall be tested for satisfactory operation by the Contractor and the results shall be submitted to the Engineer.

.8 The Contractor shall perform megger tests on all feeders and branch circuits before energizing any portion of the electrical system.

544.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of median flashing lights with posts installed in accordance with this Item.

544.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of installation, as identified under the Contract.

REMOVAL OF MEDIAN FLASHING LIGHT

ITEM: 545

545.1 DESCRIPTION

.1 This Item consists of the removal of a median flashing light with post and wire.

545.2 MATERIALS

.1 None Identified.

545.3 SUBMITTALS

.1 Prior to commencing the Work, the Contractor shall submit a copy of the wiring permit to the Engineer.

545.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Electrical Work shall be in accordance with the Canadian Electrical Code.

  .1 Electrical equipment shall be removed in accordance with New Brunswick Regulation 84-165 (Electrical Installation and Inspection Act).

.3 Median flashing light, post and hardware shall be removed from the concrete median barrier or screw foundation, in such a manner so as to minimize damage to the unit.

.4 Median flashing light and post shall be handled with a non-metallic sling.

.5 Wire shall be disconnected and removed from the underground duct between the median light and power point.

  .1 Wire shall be rolled and labelled to indicate the length.

.6 Materials shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Loss or damage to materials during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any materials damaged or lost.

545.5 MEASUREMENT FOR PAYMENT

.1 The Quantity measured for payment shall be the number of median flashing lights removed in accordance with this Item.

545.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

550.1 DESCRIPTION

.1 This Item consists of the installation of a sign post.

550.2 MATERIALS

.1 The sign post and hardware shall be available from the Owner at DOT, Fredericton, NB.

550.3 SUBMITTALS

.1 None identified.

550.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall be responsible for transporting, unloading, storing and distributing materials from DOT Fredericton to the Work Area(s).

.3 The Contractor shall be responsible for all materials and for any damage or loss from the time of receipt of the materials until such time that the materials have been accepted in the Work.

.4 The sign post shall be handled by a non-metallic sling.

.5 The sign post shall be plumbed and fastened to the sign base with the anchor bolts provided with a minimum torque of 400 N•m and in accordance with Standard Drawing 550-1.

.6 After installation, the sign posts must be clean.

.7 The installation of sign posts shall be immediately followed by the installation of the sign installed under Item 552.

550.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of sign posts installed in accordance with this Item.

550.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

551.1 DESCRIPTION

.1 This Item consists of the removal of a sign post.

551.2 MATERIALS

.1 None identified.

551.3 SUBMITTALS

.1 None identified.

551.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Work shall be carried out in such a manner so as to avoid damage to the post.

.3 The post shall be handled with a non-metallic sling.

.4 All materials shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Any loss or damage to materials during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any materials damaged or lost.

  .2 The Contractor shall identify all sign posts by marking the sign number on the cap with a permanent black marker.

551.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of sign posts removed in accordance with this Item.

551.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

552.1 DESCRIPTION

.1 This Item shall consist of the assembly and installation of an extruded aluminum roadside sign on one or more sign posts.

552.2 MATERIALS

.1 All materials shall be available from the Owner from stock, at DOT, Fredericton, NB.

552.3 SUBMITTALS

.1 None identified.

552.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall be responsible for transporting, unloading, storing and distributing materials from DOT Fredericton to the Work Area(s).

.3 The Contractor shall be responsible for all materials and for any damage or loss from the time of receipt of the materials until such time that the materials have been accepted in the Work.

.4 Sign panels shall be transported and stored in a vertical position with the sign faces protected, with no more than ten sign sections in one row.

.5 Direct contact with the sign faces shall be avoided at all times.

.6 Sign panels shall be handled with a non-metallic sling.

.7 Sign panels shall be installed as shown in the Contract Documents and Standard Drawing 552-1 through 552-6.

.8 Sign panels shall be immediately installed following the installation of the sign post.

.9 After installation, the signs shall be clean.

552.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of roadside signs assembled and installed in accordance with this Item.

552.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

553.1 DESCRIPTION

.1 This Item consists of the removal of an extruded aluminum sign mounted on one or more posts.

553.2 MATERIALS

.1 None identified.

553.3 SUBMITTALS

.1 None identified.

553.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Work shall be carried out in such a manner so as to avoid damage to the roadside sign, post and the adjacent and surrounding Roadway.

  .1 The Contractor shall be responsible, at his own expense, for any repair of such damage resulting from this Work.

.3 Signs shall be handled with a non-metallic sling.

.4 Signs shall be removed from the sign post(s) and disassembled into 300 mm sign panels.

.5 Panels for each sign shall be packaged and labelled, with permanent ink, indicating the sign number as specified on the Plans.

.6 Materials shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Any loss or damage to materials during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any materials damaged or lost.

553.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of signs removed in accordance with this Item.

553.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

554.1 DESCRIPTION

.1 This Item consists of the construction of a reinforced concrete foundation for an overhead sign Structure.

554.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Concrete shall be supplied in accordance with 301.2, class of exposure C-2.

.3 Reinforcing steel shall be supplied in accordance with 304.2 and shall be of the size and shape as indicated on the Plans.

.4 Material for anchor bolts shall conform to the requirements of ASTM Specification A325 Type 1 or A449.

  .1 Anchor bolts, nuts and washers shall be hot-dip galvanized to ASTM A153 Class C.

.5 Backfill shall be supplied in accordance with 167.2.

554.3 SUBMITTALS

.1 Submittals are required in accordance with any cross referenced Item and referred to as forming part of this Item.

554.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Construction of the foundation shall be as indicated in the Contract Documents.

.3 Excavation shall conform to the requirements of 161.4.

.4 Placement of reinforcing steel shall conform to the requirements of 304.4.

.5 Formwork and concrete placement and curing shall be in accordance with 301.4.

.6 Anchor bolts shall be installed to conform with the requirements noted on the Standard Drawings 554-1, 554-2 and Item 555.

554.4 .7 The Contractor may supply either:

- .1 Anchor System "A" Embedded Anchor Bolts
- .2 Anchor System "B" - Structural Inserts
  - .1 The Contractor shall submit shop drawings in accordance with Item 956.
  - .2 Systems shall be designed for a safe working load of 139 kN per anchor, with a factor of safety against failure equal to at least 3, and a statement to this effect shall be included on the submitted shop drawings.

.8 The Contractor shall supply a plywood template, made to suit the bolt size and spacing, to the tolerances specified for each group of anchor bolts.

.9 Top surfaces of the foundation shall have a level, smooth, trowelled finish.

.10 Overhead sign Structures shall not be erected until at least seven Days after placing of the concrete foundation.

.11 Backfilling shall be carried out in accordance with 166.4.

554.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of reinforced concrete foundations for overhead sign Structures constructed in accordance with this Item.

554.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

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555.5 MEASUREMENT FOR PAYMENT 555-8

555.6 BASIS OF PAYMENT 555-8

555.1 DESCRIPTION

.1 This Item consists of the supply and erection of an overhead sign Structure.

555.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 The Contractor shall supply the overhead sign Structure in accordance with the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals", referred to hereinafter in this Item as the AASHTO specifications, and/or as modified in the Contract Documents.

.3 Materials shall be in accordance with the details presented in the Contract Documents.

555.2 .4 The following Specifications, but not limited to, shall form part of this Item:

.1 Specifications issued by the Canadian Standards Association (CAN/CSA).

C22.2 No. 45	Rigid Metal Conduit
C22.2 No.123	Aluminum Sheathed Cables
G189	Sprayed Metal Coatings for Atmospheric Protection
S37	Antennas, Towers and Antenna-Supporting Structures
S157	Strength Design in Aluminum
W47.2	Certification of Companies for Fusion Welding of Aluminum
W59.2	Welded Aluminum Construction
W178.2	Certification of Welding Inspectors
Z169	Aluminum Pipe and Pressure Piping Systems
Z245.6	Coiled Aluminum line Pipe and Accessories

555.2.4 .2 Specifications issued by American Society for Testing and Materials (ASTM).

A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A193	Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
A276	Stainless and Heat-Resisting Steel Bars and Shapes
A322	Steel Bars, Alloy, Standard Grades
A325	High-Strength Bolts for Structural Steel Joints including Suitable Nuts and Plain Hardened Washers
A449	Quenched and Tempered Steel Bolts and Studs
A563	Carbon and Alloy Steel Nuts
B108	Aluminum-Alloy Permanent Mold Castings
B209	Aluminum and Aluminum-Alloy Sheet and Plate
B221	Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
E34	Chemical Analysis of Aluminum and Aluminum-Alloys
E55	Sampling Wrought Non-ferrous Metals and Alloys for Determination of Chemical Composition

555.2.4 .3 Specifications issued by the Canadian General Standards Board (CGSB).

1-GP-108M	Specification for Paint; Acid and Alkali Resistant, Black
1-GP-178M	Primer, Zinc Dust/Zinc Oxide, Alkyd (for Galvanized Surfaces)
85-GP-16M	Painting Galvanized Steel

555.2.4 .4 Specifications issued by the American Association of State Highway and Transportation officials (AASHTO).

.1 Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.

.5 Specifications issued by the National Research Council of Canada, as the "Supplement to the National Building Code of Canada".

.6 Materials and the aluminum alloys used for the fabrication of the overhead sign Structure shall conform to the requirements of Table 555-1.

Table 555-1
Description of the Various Metallic Components Used in the Fabrication of the Overhead Sign Structure.

Structural Component	Metal or Aluminum Alloy Components	Applicable Standards
Overhead Sign Structure trusses and columns	6351-T6 6351-T6 6061-T6	A.S.T.M. B221 CAN/CSA ASTM B209*
Flanges and brackets to connect the horizontal main chords of the truss and base plate.	6061-T6 plate 6061-T6 plate SG70P-T6A casting A356.0-T61	ASTM B209 CAN/CSA CAN/CSA ASTM B108
Bolts to fasten the horizontal trusses.	A325-galvanized	ASTM A325
Hardware	A276 TYPE 304 stainless steel	ASTM A276
Caps and covers	SG70N casting 356-0 casting 6061-T6 plate 6061-T6 plate	CAN/CSA ASTM B108 ASTM B209 CAN/CSA
Bolts and nuts for connecting hardware to Structure	A193 stainless steel	ASTM A193

555.2 .5 Filler alloy 5356 shall be used in all welding of the structural members except for welding to castings, where filler alloy 4043 shall be used.

.6 Grout shall be an approved non-metallic, non-shrink grout.

555.2 .7 Materials shall be stored on skids at least 150 mm off the ground in an organized, straight and horizontal fashion to avoid permanent distortion.

555.3 SUBMITTALS

.1 The Contractor shall submit the name of the approved fabricator proposed for the Work in advance of commencing fabrication.

  .1 The approved fabricator shall be selected from the list provided by the Owner in the Contract Documents.

.2 The Contractor shall certify that the fabrication shop proposed for welding on aluminum Structures is certified by the Canadian Welding Bureau (CWB) to the requirements of CAN/CSA W47.2.

.3 The Contractor shall submit a copy of the CWB issued ticket for each welder responsible for conducting the Work and for a qualified welding supervisor, not less than 7 Days prior to commencing the Work.

.4 The Contractor shall submit for approval a proposed welding procedure approved by the CWB, 7 Days in advance of the scheduled fabrication.

.5 The Contractor shall submit three copies of release notes certifying chemical analyses of all materials used for the fabrication of the overhead sign Structures, to ascertain that the analyses conform to the requirements of this Item.

.6 The Contractor shall submit shop drawings in accordance with Item 956.

.7 The Contractor shall submit erection drawings, calculations and the erection procedure, stamped and signed by a Professional Engineer registered or licensed to practise in the Province of New Brunswick, a minimum of 14 Days before the scheduled start of erection.

555.4 CONSTRUCTION

555.4 .1 General

  .1 The Contractor shall fabricate and erect the overhead sign Structure at the locations and of a type as described in the Contract Documents.

  .2 The Contractor shall ensure that dimensional tolerances and indicated dimensions are compatible and congruent with aspects of the Work supplied under Item 554 and/or Item 557.

  .3 The aluminum fabricator's shop shall be kept clean at all times, and shall be separated from any steel fabrication in order to ensure that weld areas are not contaminated so as to cause weld porosity.

555.4 .2 Trusses

.1 Horizontal Structure shall be a sectional truss of one or several units.

.2 Two circumferential shop splices per chord will be considered, if located outside the centre half of the span.

  .1 Such a splice shall be located within 1.0 to 1.2 times the chord diameter from the centreline of a braced point.

  .2 Welds shall be complete penetration groove welds made with permanent internal backing rings, in accordance with clause 5.6.3 of CAN/CSA W59.2.

555.4 .3 Columns

.1 Each vertical Structure, shall be made of a welded assembly of two extruded tubes connected to each other by extruded tubular diagonals as indicated in the Contract Documents.

555.4 .4 Base Plates

.1 Underside of each base plate shall be coated with a coat of bituminous paint conforming to CGSB 1-GP-108M.

.2 Removable cast aluminum anchor base plate caps shall be attached to the upright portion of the base by means of a hexagonal head cap screw.

555.4 .5 Welding

.1 Welding shall be in accordance with the requirements of CAN/CSA W59.2.

555.4 .6 Surface Finishing

.1 Aluminum components of the overhead sign Structures shall be belt sanded with a number 80 grit to obtain a uniform metallic satin finish after fabrication and following repairs required on site.

.2 Aluminum components shall have silicon wax applied after complete fabrication and following any repairs or removal of the wax covering at the Work Site.

.3 After erection, the Structure shall have any blemishes or marks removed and restored to match the fabrication finish.

555.4 .7 Inspection and Testing

.1 The Owner may at any time take samples for either a wet chemical analysis or a petrographic analysis for determination of the chemical composition.

  .1 Chemical analysis shall be carried out in accordance with ASTM E34, and sampling for chemical analysis shall be done in accordance with ASTM E55.

555.4.7 .2 Welding inspection shall be carried out in accordance with CAN/CSA W59.2.

.3 Visual inspection shall be carried out in the fabricators shop on 100% of completed welds.

  .1 Inspection shall be carried out by an independent inspector certified in accordance with CAN/CSA W178.2.

.4 The inspector's report shall be submitted to the Engineer within 3 Days of the inspection.

.5 Faulty welds shall be corrected as specified in CAN/CSA W59.2, clause 5.12.

.6 Corrected welds shall be re-inspected.

555.4 .8 Dimensional Tolerances

.1 Fabrication dimensions shall be based on an assumed erection temperature of 10 °C and shall be within the following tolerances:

  .1 Overall length of columns shall be within ± 15 mm of the length specified.

  .2 Overall assembled length of truss chords shall be within ± 15 mm of the length specified.

  .3 Location of any one of the four splice plates shall be within ± 3 mm of a vertical plane at right angles to the longitudinal axis of the truss.

.2 Prior to tightening bolts, any gaps between plates are to be filled with shims matching the plates in diameter and hole location.

.3 Allowable deviation from straight, of members and chords shall not exceed 1 mm/m when the outside diameter is equal to or less than 150 mm; or 2 mm/m in all other cases.

.4 Offset between the centre of the base plate bolt circle and the centre of the columns shall not exceed 3 mm.

.5 Distance between tubes comprising the chords of a truss or the columns of a vertical support, measured normal to and between their longitudinal axes, shall be accurate within a tolerance of 3 mm of the dimension specified.

.6 Truss support brackets that are welded to the columns shall be accurate within a tolerance of 6 mm of their finished height and lateral location to that specified.

.7 Holes are to be located such that, when two parts are assembled, there will be no offset greater than 1 mm between the centre lines of matching holes.

.8 Horizontal offset of the vertical projection of the top centreline of the columns from their bottom centrelines shall not exceed 10 mm after erection.

555.4.8 .9 Notwithstanding 555.4.9.4 and 555.4.9.5, the centres of holes in the base plates of the finished Structure shall be accurate within a tolerance of 3 mm of that specified based on the actual locations of the anchors as measured in the field.

555.4 .9 Handholes

.1 One column on each end of the Structure shall be provided with a drawn handhole located on the ditch side of the member.

  .1 Handholes shall be located in columns directly opposite each other.

555.4 .10 Erection

.1 The Contractor shall deliver the overhead sign Structure to the Work Site and shall supply a storage facility for the overhead sign Structure if it cannot be installed immediately.

  .1 Storage areas shall be at least 10 m from the edge of the travel Lane of the Highway with the overhead sign Structure raised a minimum of 300 mm above grade on blocking.

.2 The Contractor shall be responsible for the safe storage of the Structure and adequate support. including sufficient and satisfactory blocking to ensure that the members are not distorted, overstressed or otherwise damaged.

.3 Following erection and plumbing of the Structure, a non-shrink, non-metallic grout, shall be placed in accordance with the manufacturers instructions, under the base plate.

  .1 Central holes in the base plate shall be blocked to prevent escape of grout.

.4 Structures shall be cleaned to a bright new condition to the satisfaction of the Engineer before final inspection.

.5 If the galvanized coating on the bolts is damaged during installation of the Structure, or if the bolts have rusted, the bolts shall be wire brushed to remove the loose coating or rust and washed clean using a non-organic solvent. When the surface is dry it shall be coated with a zinc-rich paint in accordance with CGSB Specification 1-GP-178M or equivalent system as identified in CGSB 85-GP-16M.

.6 The Contractor shall install upon the complete erected Structure a minimum of 20m^2 of sign panel (or equivalent weight in sand filled bags which must be securely attached until the sign panels are installed) on the same day the Structure is erected.

555.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of overhead sign Structure(s) supplied and erected in accordance with this Item.

555.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of overhead sign Structure, as identified under the Contract.

.2 The Owner will make partial payment for the overhead sign structure in accordance with 908.7.

556.1 DESCRIPTION

.1 This Item consists of dismantling and removing an overhead sign Structure.

556.2 MATERIALS

.1 None identified.

556.3 SUBMITTALS

.1 None identified.

556.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The removal shall be carried out in a manner so as to avoid damage to the overhead sign Structure and the adjacent and surrounding Roadway.

  .1 The Contractor shall be responsible, at his own expense, to repair any such damage resulting from the Work.

.3 The overhead sign Structure shall be handled with a non-metallic sling.

.4 The overhead sign Structure shall be dismantled in one day.

.5 All materials shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

  .1 Any loss or damage to materials during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any materials damaged or lost.

556.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of overhead sign Structures dismantled and removed in accordance with this Item.

556.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of overhead sign Structure, as identified under the Contract.

557.1 DESCRIPTION

.1 This Item consists of the assembly and installation of an extruded aluminum sign on an overhead sign Structure.

557.2 MATERIALS

.1 All materials shall be available from the Owner from stock, at DOT, Fredericton, NB.

557.3 SUBMITTALS

.1 None identified.

557.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall be responsible for transporting, unloading, storing and distributing materials from DOT Fredericton to the Work Area.

.3 The Contractor shall be responsible for all materials and for any damage or loss from the time of receipt of the materials until such time that the materials have been accepted in the Work.

.4 Sign panels shall be transported and stored in a vertical position with the sign faces protected, and with no more than ten signs in one row.

.5 Direct contact with the sign faces shall be avoided at all times.

.6 Sign panels shall be handled with a non-metallic sling.

.7 Sign panels shall be secured to the Structure in accordance with the Plans.

.8 After installation, the signs shall be clean.

557.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of overhead signs assembled and installed in accordance with this Item.

557.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

558.1 DESCRIPTION

.1 This Item consists of the dismantling and removal of a sign from an overhead sign Structure.

558.2 MATERIALS

.1 None identified.

558.3 SUBMITTALS

.1 None identified.

558.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Work shall be carried out in such a manner so as to avoid damage to the overhead sign and the overhead sign Structure and the adjacent and surrounding Roadway.

  .1 The Contractor shall be responsible, at his own expense, to repair any such damage resulting from the Work.

.3 Signs shall be handled with a non-metallic sling.

.4 Signs shall be removed from the sign Structure and disassembled into 300 mm sign panels.

.5 Panels for each sign shall be packaged and labelled with permanent ink, indicating the sign number as specified on the Plans.

.6 Materials shall remain the property of the Owner and shall be transported to DOT, Fredericton, NB.

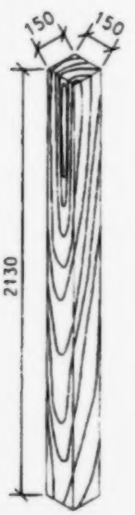
  .1 Any loss or damage to materials during removal, transporting and/or storage shall be Contractor's responsibility and he shall replace any materials damaged or lost.

558.5 MEASUREMENT FOR PAYMENT

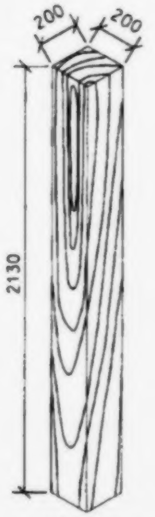
.1 The Quantity to be measured for payment shall be the number of overhead signs dismantled and removed in accordance with this Item.

558.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.


150
150
2130

TYPICAL GUIDE POST


200
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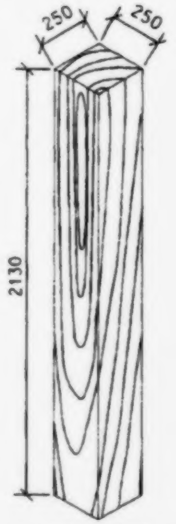
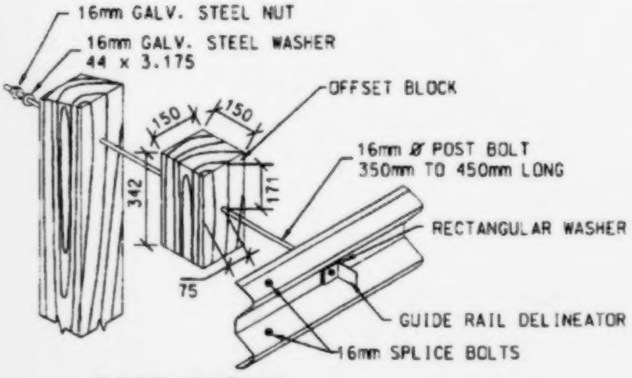
2130

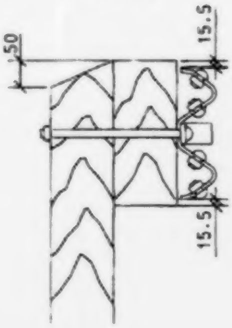
GUIDE POST AT INTERMEDIATE LOCATIONS


250
250
2130

GUIDE POST ADJACENT TO STRUCTURE

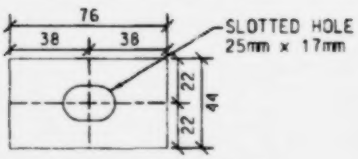

16mm GALV. STEEL NUT
16mm GALV. STEEL WASHER 44 x 3.175
OFFSET BLOCK
150
150
342
171
75
16mm Ø POST BOLT 350mm TO 450mm LONG
RECTANGULAR WASHER
GUIDE RAIL DELINEATOR
16mm SPLICE BOLTS

POST DETAIL



NOTE:

OFFSET BLOCK & RAIL TO BE INSTALLED BEFORE POST IS CUT OFF


76
38
38
SLOTTED HOLE 25mm x 17mm
22
22
44

RECTANGULAR WASHER
(AT EACH POST LOCATION)

SPACING OF GUIDE RAIL DELINEATOR	
ON TANGENTS	30m
ON CURVES WITHOUT A CURVE SIGN	15m
ON CURVES REQUIRING CURVE SIGN	7.5m

Guide Post Details

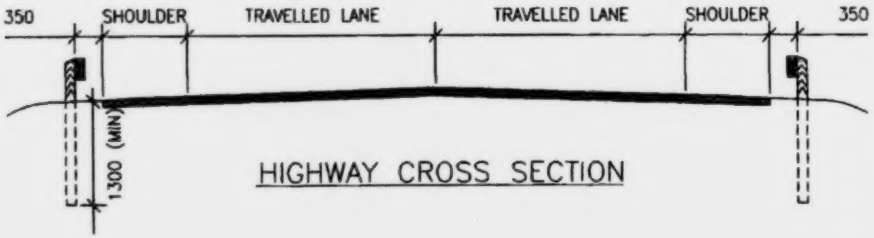
FILE 510-2

STANDARD SPECIFICATIONS
DEPARTMENT of TRANSPORTATION

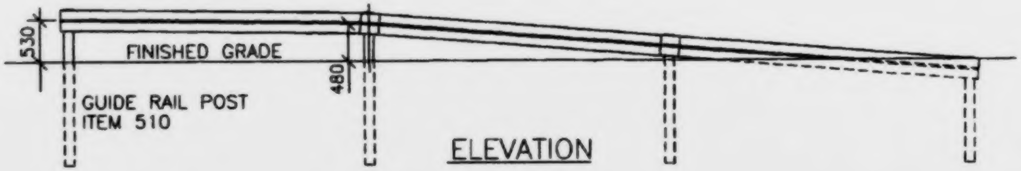
New Brunswick / Nouveau Brunswick

STANDARD DRAWINGS

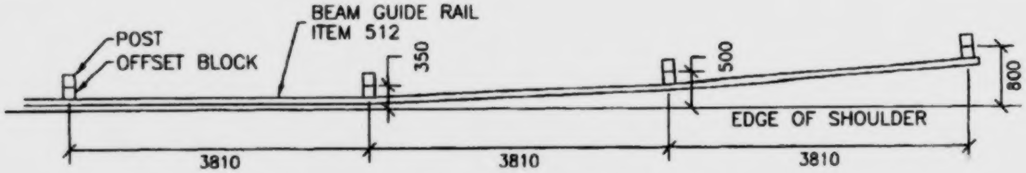
ITEM: 599


350
SHOULDER
TRAVELLED LANE
TRAVELLED LANE
SHOULDER
350
1300 (MIN)

HIGHWAY CROSS SECTION


530
FINISHED GRADE
480
GUIDE RAIL POST
ITEM 510

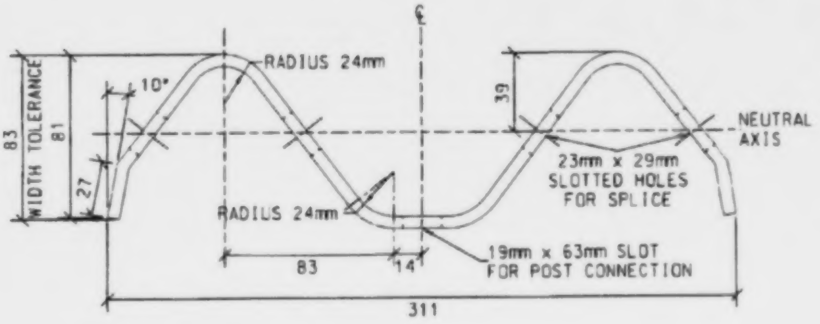
ELEVATION


POST
OFFSET BLOCK
BEAM GUIDE RAIL
ITEM 512
350
500
800
EDGE OF SHOULDER
3810
3810
3810

POST SPACING FOR TYPICAL END TERMINATION

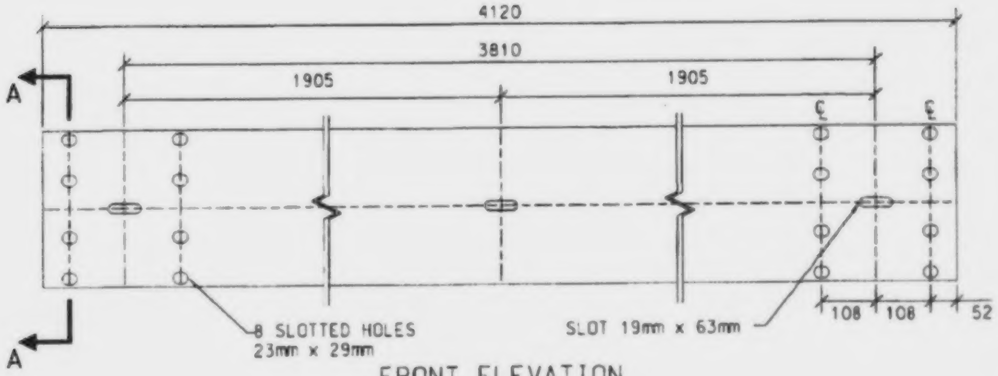
Guide Post and Guide Rail Details

January, 2006 — TRAFFIC CONTROL DEVICES — Standard Drawing 510-2


℄
RADIUS 24mm
10°
83
WIDTH TOLERANCE
81
27
39
NEUTRAL AXIS
23mm x 29mm SLOTTED HOLES FOR SPLICE
RADIUS 24mm
83
14
19mm x 63mm SLOT FOR POST CONNECTION
311

AS PER AASHTO M180

SECTION A-A


4120
3810
1905
1905
A
A
℄
℄
8 SLOTTED HOLES 23mm x 29mm
SLOT 19mm x 63mm
108
108
52

FRONT ELEVATION

Beam Guide Rail Details

File: 512-1

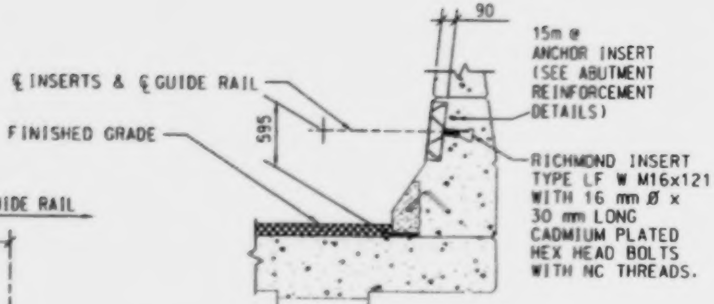
File: 512-2

STANDARD SPECIFICATIONS
DEPARTMENT of TRANSPORTATION

STANDARD DRAWINGS

New Nouveau Brunswick

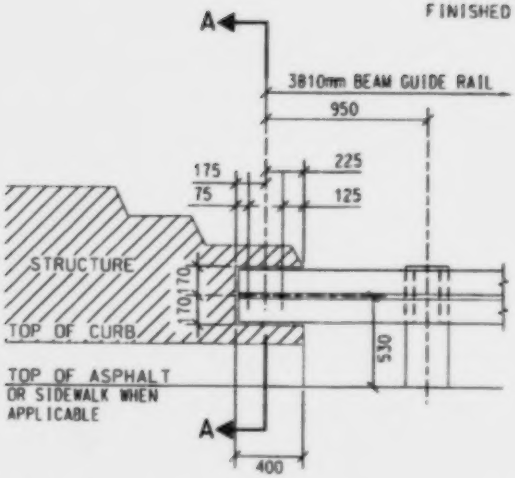
ITEM: 599



90
15m @
ANCHOR INSERT
(SEE ABUTMENT
REINFORCEMENT
DETAILS)
℄ INSERTS & ℄ GUIDE RAIL
FINISHED GRADE
595
RICHMOND INSERT
TYPE LF W M16x121
WITH 16 mm Ø x
30 mm LONG
CADMIUM PLATED
HEX HEAD BOLTS
WITH NC THREADS.

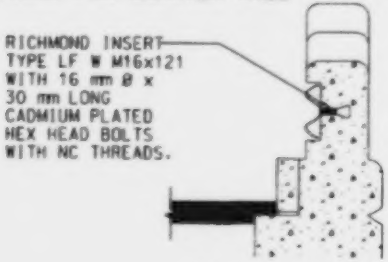
SECTION A-A

TYPICAL FOR BARRIER WALL



A
3810mm BEAM GUIDE RAIL
950
175
75
225
125
STRUCTURE
170
170
TOP OF CURB
530
TOP OF ASPHALT
OR SIDEWALK WHEN
APPLICABLE
A
400

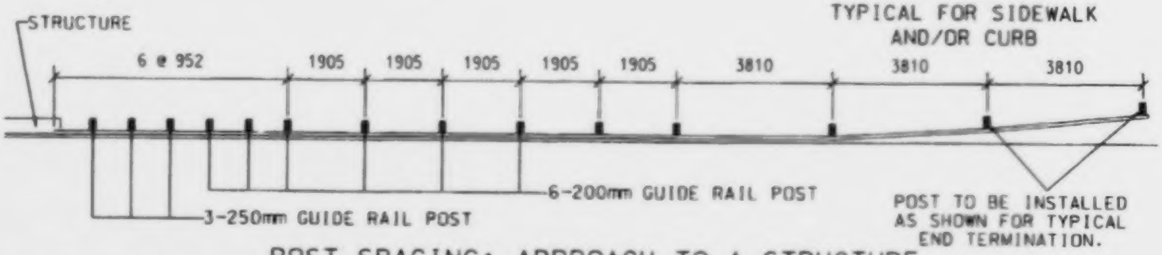
ELEVATION FOR GUIDE RAIL CONNECTION



RICHMOND INSERT
TYPE LF W M16x121
WITH 16 mm Ø x
30 mm LONG
CADMIUM PLATED
HEX HEAD BOLTS
WITH NC THREADS.

SECTION A-A

TYPICAL FOR SIDEWALK
AND/OR CURB



STRUCTURE
6 @ 952
1905
1905
1905
1905
1905
3810
3810
3810
6-200mm GUIDE RAIL POST
3-250mm GUIDE RAIL POST
POST TO BE INSTALLED
AS SHOWN FOR TYPICAL
END TERMINATION.

POST SPACING: APPROACH TO A STRUCTURE

January, 2006

Guide Rail / Structure Details

TRAFFIC CONTROL DEVICES

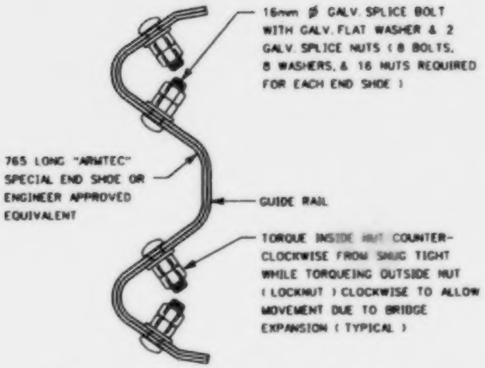
Standard Drawing 512-2

STANDARD SPECIFICATIONS
DEPARTMENT of TRANSPORTATION

STANDARD DRAWINGS

New Brunswick Nouveau

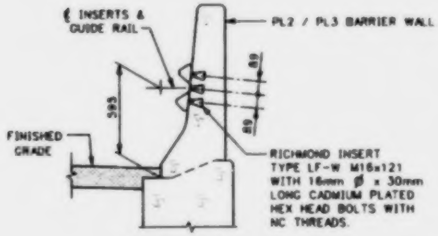
ITEM: 599


16mm ∅ GALV. SPLICE BOLT WITH GALV. FLAT WASHER & 2 GALV. SPLICE NUTS (8 BOLTS, 8 WASHERS, & 16 NUTS REQUIRED FOR EACH END SHOE)
765 LONG "ARMTEC" SPECIAL END SHOE OR ENGINEER APPROVED EQUIVALENT
GUIDE RAIL
TORQUE INSIDE NUT COUNTER-CLOCKWISE FROM SNUG TIGHT WHILE TORQUEING OUTSIDE NUT (LOCKNUT) CLOCKWISE TO ALLOW MOVEMENT DUE TO BRIDGE EXPANSION (TYPICAL)

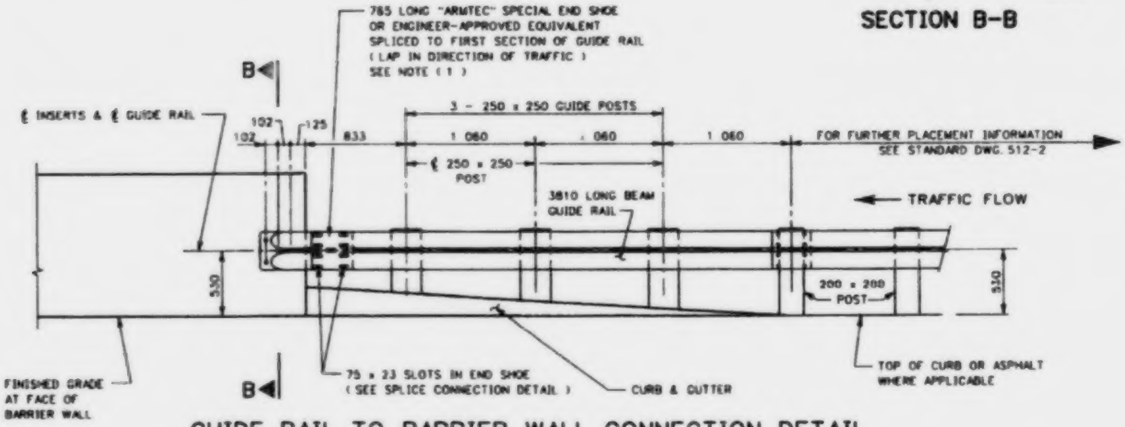
SPLICE CONNECTION DETAIL

NOTES :

(1) SPECIAL END SHOE TO BE HOT-DIPPED GALVANIZED, WITH 75 x 23 mm SLOTS AS SHOWN. 16 mm ∅ GALVANIZED SPLICE BOLTS TO BE CENTERED IN SLOTS BEFORE TIGHTENING. ALL MATERIALS SUPPLIED & INSTALLED BY CONTRACTOR. SEE SPLICE CONNECTION DETAIL FOR MORE INFORMATION.


℄ INSERTS & GUIDE RAIL
PL2 / PL3 BARRIER WALL
60
395
60
FINISHED GRADE
RICHMOND INSERT TYPE LF-W M16x121 WITH 16mm ∅ x 30mm LONG CADMIUM PLATED HEX HEAD BOLTS WITH NC THREADS.

SECTION B-B

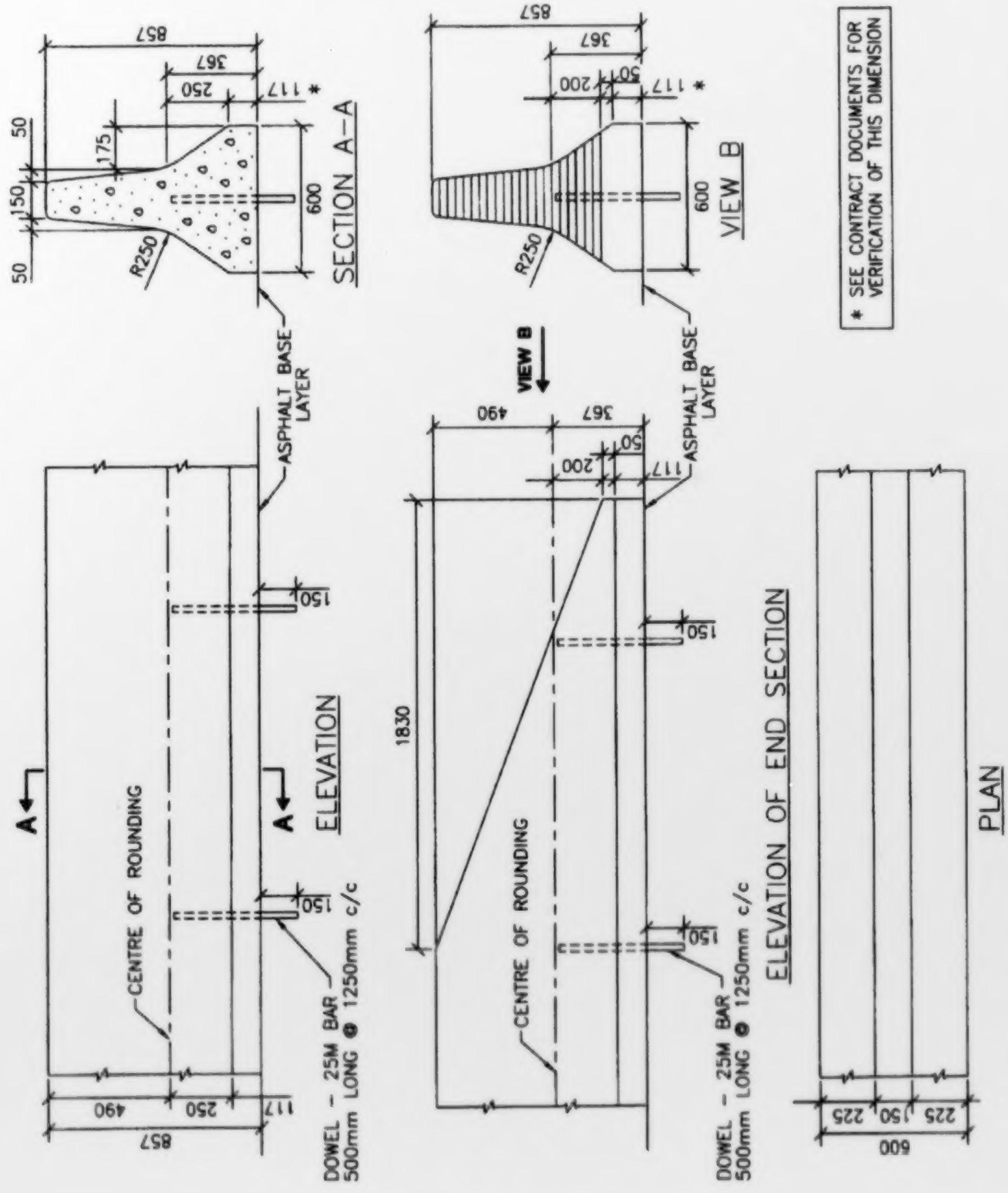

765 LONG "ARMTEC" SPECIAL END SHOE OR ENGINEER-APPROVED EQUIVALENT SPLICED TO FIRST SECTION OF GUIDE RAIL (LAP IN DIRECTION OF TRAFFIC) SEE NOTE (1)
B
℄ INSERTS & ℄ GUIDE RAIL
102
102
125
833
3 - 250 x 250 GUIDE POSTS
1 060
1 060
1 060
℄ 250 x 250 POST
FOR FURTHER PLACEMENT INFORMATION SEE STANDARD DWG. 512-2
TRAFFIC FLOW
3810 LONG BEAM GUIDE RAIL
530
530
200 x 200 POST
FINISHED GRADE AT FACE OF BARRIER WALL
B
75 x 23 SLOTS IN END SHOE (SEE SPLICE CONNECTION DETAIL)
CURB & GUTTER
TOP OF CURB OR ASPHALT WHERE APPLICABLE

GUIDE RAIL TO BARRIER WALL CONNECTION DETAIL

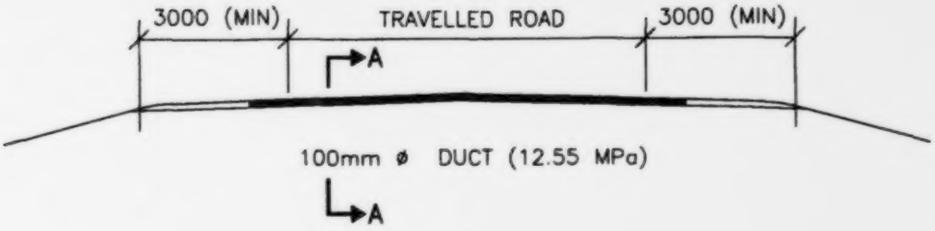
January, 2006

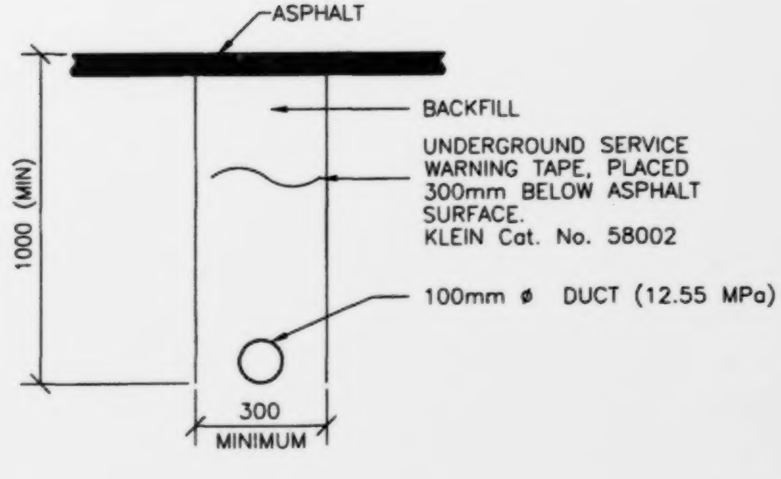
Guide Rail / Structure Details

TRAFFIC CONTROL DEVICES


A
A
CENTRE OF ROUNDING
857
490
250
117
150
150
DOWEL - 25M BAR
500mm LONG @ 1250mm c/c
ELEVATION
ASPHALT BASE LAYER
50
150
50
175
R250
857
367
250
* 117
600
SECTION A-A
1830
490
367
200
50
117
VIEW B
CENTRE OF ROUNDING
150
150
DOWEL - 25M BAR
500mm LONG @ 1250mm c/c
ELEVATION OF END SECTION
ASPHALT BASE LAYER
R250
857
367
200
50
* 117
600
VIEW B
* SEE CONTRACT DOCUMENTS FOR VERIFICATION OF THIS DIMENSION
600
225
150
225
PLAN

Cast-in-Place Concrete Barrier Details


3000 (MIN)
TRAVELLED ROAD
3000 (MIN)
A
100mm ø DUCT (12.55 MPa)
A

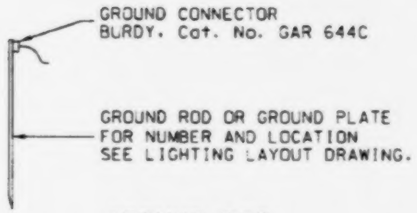

ASPHALT
BACKFILL
UNDERGROUND SERVICE WARNING TAPE, PLACED 300mm BELOW ASPHALT SURFACE. KLEIN Cat. No. 58002
100mm ø DUCT (12.55 MPa)
1000 (MIN)
300 MINIMUM

SECTION A–A

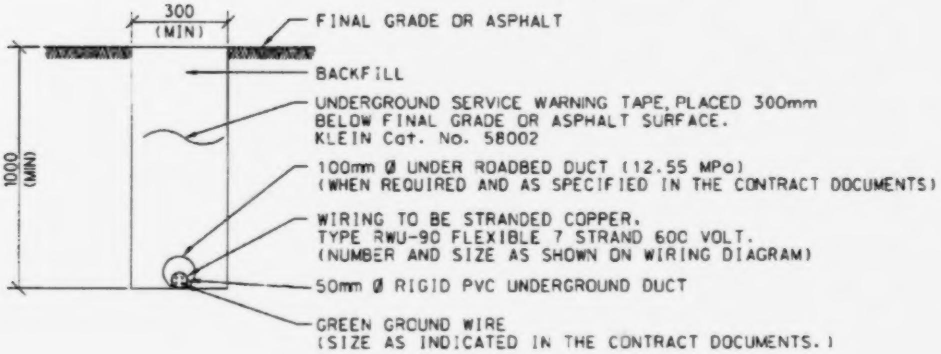
NOTE
WIRING INSTALLED UNDER ITEM 531

Under Roadbed Duct Details

File: 530-1


GROUND CONNECTOR
BURDY. Cat. No. GAR 644C
GROUND ROD OR GROUND PLATE
FOR NUMBER AND LOCATION
SEE LIGHTING LAYOUT DRAWING.

GROUND ROD


300
(MIN)
FINAL GRADE OR ASPHALT
BACKFILL
UNDERGROUND SERVICE WARNING TAPE, PLACED 300mm
BELOW FINAL GRADE OR ASPHALT SURFACE.
KLEIN Cat. No. 58002
1000
(MIN)
100mm Ø UNDER ROADBED DUCT (12.55 MPa)
(WHEN REQUIRED AND AS SPECIFIED IN THE CONTRACT DOCUMENTS)
WIRING TO BE STRANDED COPPER.
TYPE RWU-90 FLEXIBLE 7 STRAND 600 VOLT.
(NUMBER AND SIZE AS SHOWN ON WIRING DIAGRAM)
50mm Ø RIGID PVC UNDERGROUND DUCT
GREEN GROUND WIRE
(SIZE AS INDICATED IN THE CONTRACT DOCUMENTS.)

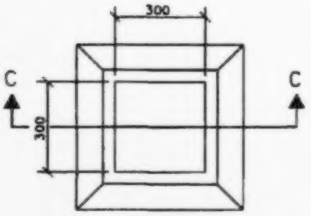
SECONDARY CABLE TRENCH

NOTES:

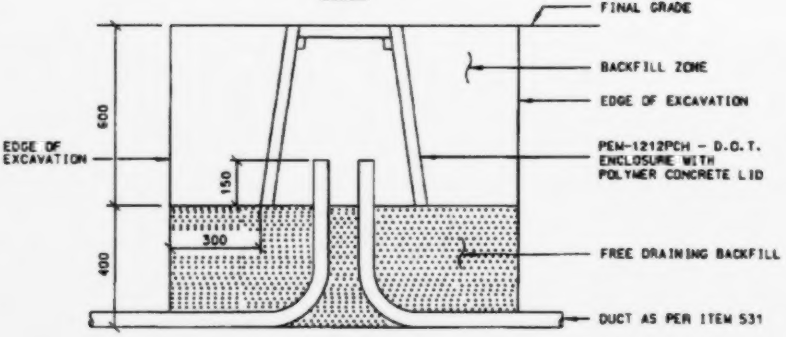
1. CHECK EXISTING AND FUTURE UTILITIES BEFORE COMMENCING EXCAVATION WORK.
2. BEFORE ANY TRENCHING TO POWER POLES. CHECK WITH NB POWER AND ALIANT FOR EXACT LOCATION.
3. CHECK WITH ALIANT FOR FIBRE-OPTIC CABLE LOCATION.
   CALL 1-800-332-3333 BEFORE DIGGING.

Underground Duct Details

File: 531-1

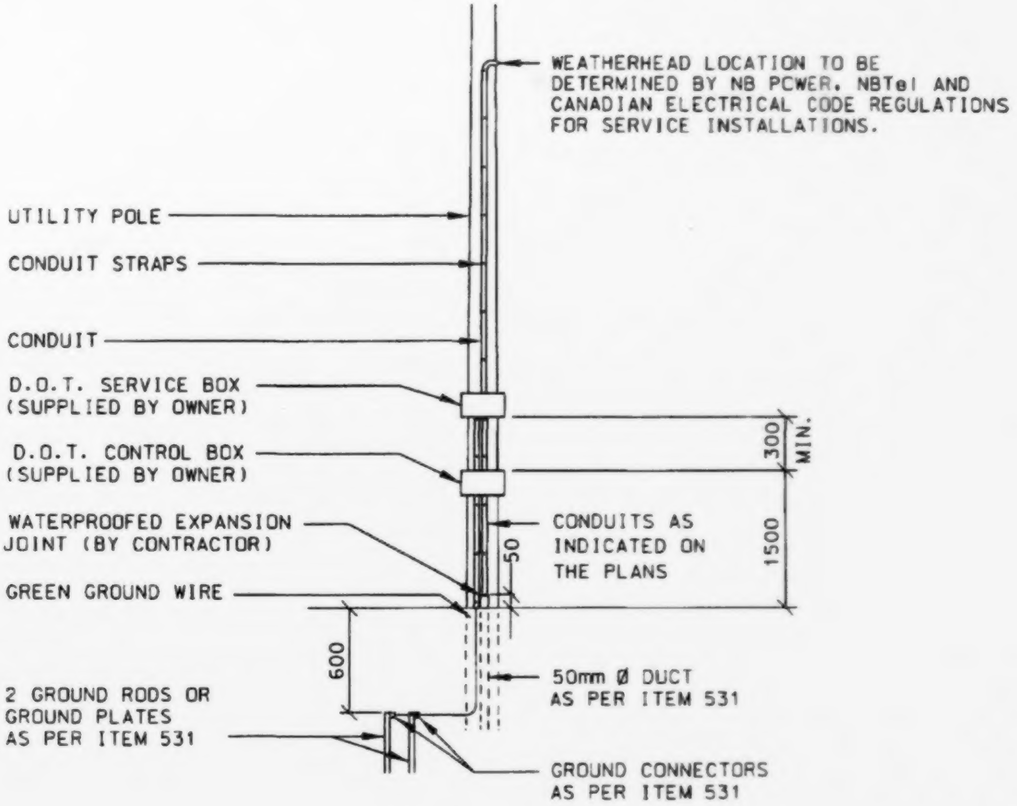


PLAN


FINAL GRADE
BACKFILL ZONE
EDGE OF EXCAVATION
600
EDGE OF EXCAVATION
PEM-1212PCH - D.O.T. ENCLOSURE WITH POLYMER CONCRETE LID
150
300
400
FREE DRAINING BACKFILL
DUCT AS PER ITEM 531

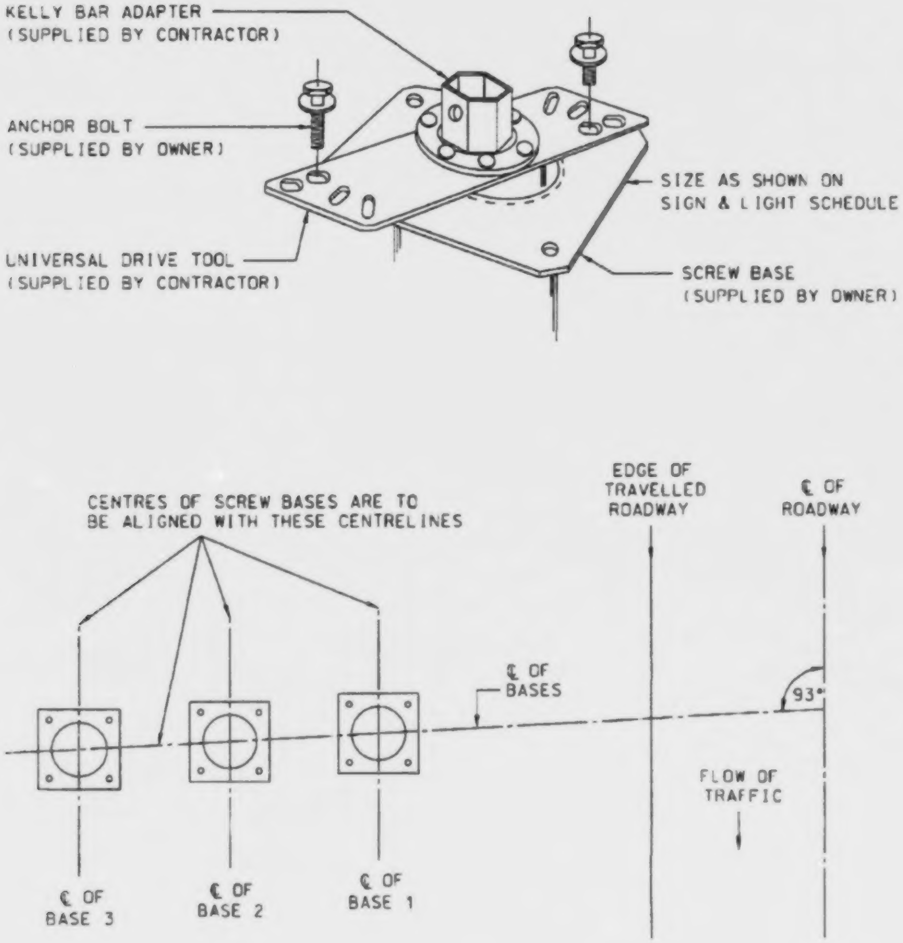
SECTION C-C

Underground Junction Box Detail


WEATHERHEAD LOCATION TO BE DETERMINED BY NB POWER, NBTel AND CANADIAN ELECTRICAL CODE REGULATIONS FOR SERVICE INSTALLATIONS.
UTILITY POLE
CONDUIT STRAPS
CONDUIT
D.O.T. SERVICE BOX (SUPPLIED BY OWNER)
D.O.T. CONTROL BOX (SUPPLIED BY OWNER)
300 MIN.
WATERPROOFED EXPANSION JOINT (BY CONTRACTOR)
50
CONDUITS AS INDICATED ON THE PLANS
1500
GREEN GROUND WIRE
600
50mm Ø DUCT AS PER ITEM 531
2 GROUND RODS OR GROUND PLATES AS PER ITEM 531
GROUND CONNECTORS AS PER ITEM 531

Power Point Detail

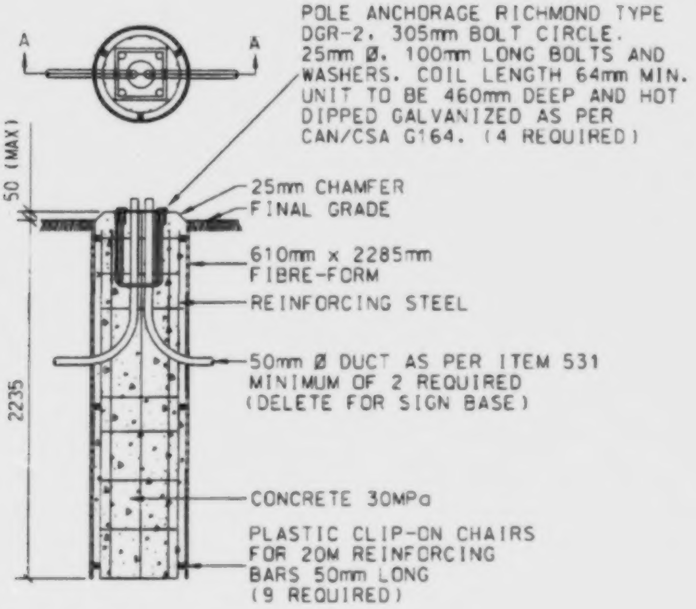
File: 533-1


KELLY BAR ADAPTER
(SUPPLIED BY CONTRACTOR)
ANCHOR BOLT
(SUPPLIED BY OWNER)
SIZE AS SHOWN ON
SIGN & LIGHT SCHEDULE
UNIVERSAL DRIVE TOOL
(SUPPLIED BY CONTRACTOR)
SCREW BASE
(SUPPLIED BY OWNER)
CENTRES OF SCREW BASES ARE TO
BE ALIGNED WITH THESE CENTRELINES
EDGE OF
TRAVELLED
ROADWAY
℄ OF
ROADWAY
℄ OF
BASES
93°
FLOW OF
TRAFFIC
℄ OF
BASE 3
℄ OF
BASE 2
℄ OF
BASE 1

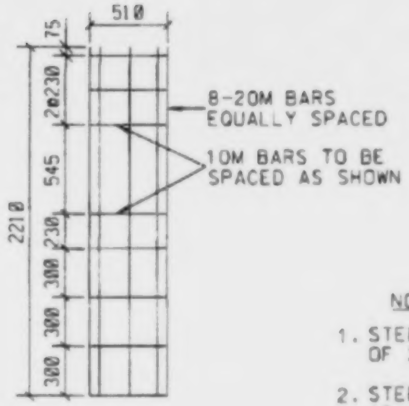
NOTE:
REQUIRED NUMBER OF BASES
INDICATED ON SIGN SCHEDULE

Screw Base Detail

File: 538-1


A
A
POLE ANCHORAGE RICHMOND TYPE DGR-2. 305mm BOLT CIRCLE. 25mm Ø. 100mm LONG BOLTS AND WASHERS. COIL LENGTH 64mm MIN. UNIT TO BE 460mm DEEP AND HOT DIPPED GALVANIZED AS PER CAN/CSA G164. (4 REQUIRED)
50 (MAX)
25mm CHAMFER
FINAL GRADE
610mm x 2285mm FIBRE-FORM
REINFORCING STEEL
50mm Ø DUCT AS PER ITEM 531 MINIMUM OF 2 REQUIRED (DELETE FOR SIGN BASE)
2235
CONCRETE 30MPa
PLASTIC CLIP-ON CHAIRS FOR 20M REINFORCING BARS 50mm LONG (9 REQUIRED)

SECTION A-A

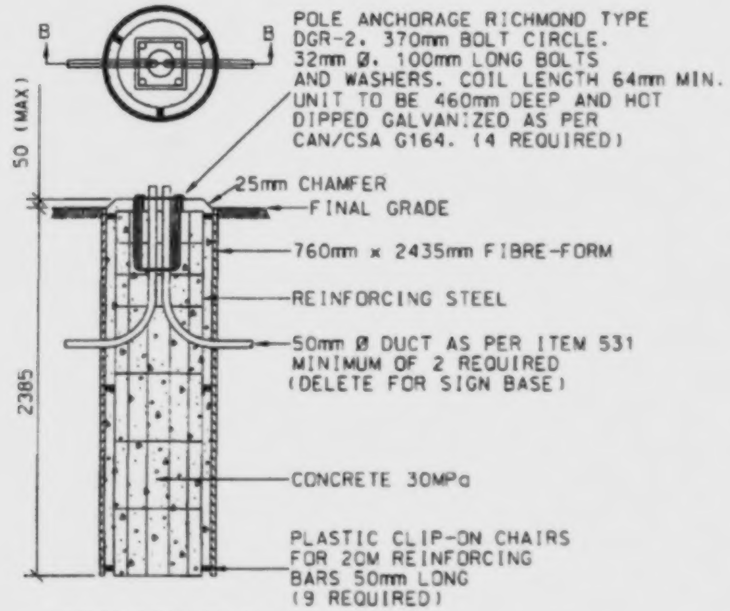

510
75
2@230
545
230
300
300
300
2210
8-20M BARS EQUALLY SPACED
10M BARS TO BE SPACED AS SHOWN

REBAR SPACING

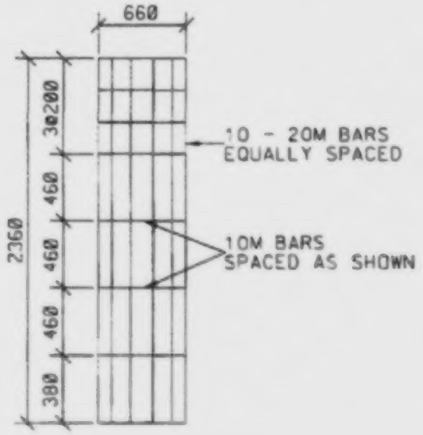
NOTE:

1. STEEL SHALL BE LAPPED MIN. OF 200mm.
2. STEEL SHALL MEET CAN/CSA G30. 12-M-GRADE 400 AND SHALL BE IN THE FORM OF DEFORMED ROUND BARS

Type "E" Sign or Light Base Details
Soil Foundation


B
B
POLE ANCHORAGE RICHMOND TYPE DGR-2. 370mm BOLT CIRCLE. 32mm Ø. 100mm LONG BOLTS AND WASHERS. COIL LENGTH 64mm MIN. UNIT TO BE 460mm DEEP AND HOT DIPPED GALVANIZED AS PER CAN/CSA G164. (4 REQUIRED)
50 (MAX)
25mm CHAMFER
FINAL GRADE
760mm x 2435mm FIBRE-FORM
REINFORCING STEEL
50mm Ø DUCT AS PER ITEM 531 MINIMUM OF 2 REQUIRED (DELETE FOR SIGN BASE)
2385
CONCRETE 30MPa
PLASTIC CLIP-ON CHAIRS FOR 20M REINFORCING BARS 50mm LONG (9 REQUIRED)

SECTION B-B


660
3@200
460
460
460
380
2360
10 - 20M BARS EQUALLY SPACED
10M BARS SPACED AS SHOWN

REBAR SPACING

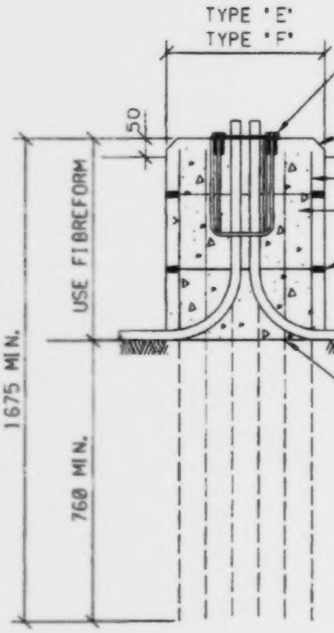
NOTE:

1. STEEL SHALL BE LAPPED MIN. OF 200mm.

2. STEEL SHALL MEET CAN/CSA G30. 12-M-GRADE 400 AND SHALL BE IN THE FORM OF DEFORMED ROUND BARS

Type "F" Sign or Light Base Details
Soil Foundation

File: 540-2



POLE ANCHORAGE RICHMOND TYPE DGR-2.
FOR TYPE "E" SEE STANDARD DRAWING 540-1.
FOR TYPE "F" SEE STANDARD DRAWING 540-2.

25mm CHAMFER

FINAL GRADE

REINFORCING STEEL CAGE

CONCRETE 30MPa

PLASTIC CLIP-ON CHAIRS FOR 20M REINFORCING RODS (6 REQUIRED)

50mm Ø DUCT AS PER ITEM 531 MINIMUM OF 2 REQUIRED (DELETE FOR SIGN BASE)

BEDROCK LINE

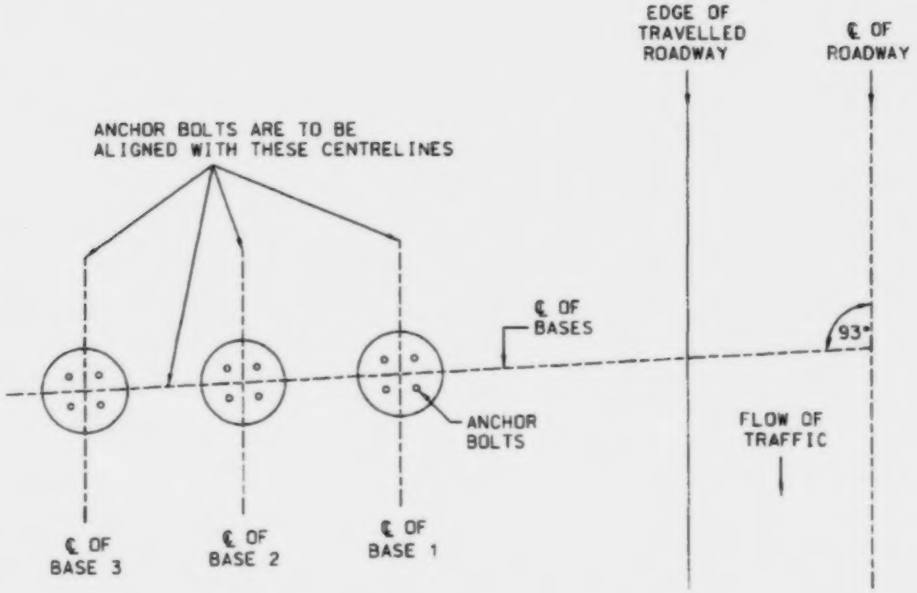
50mm Ø HOLES SHALL BE DRILLED INTO BEDROCK TO ACCEPT REINFORCING STEEL

REINFORCING STEEL SHALL BE GROUTED INTO THE ROCK WITH A GROUT APPROVED BY THE ENGINEER.

NOTE:

1. STEEL SHALL BE LAPPED MIN. OF 200mm.
2. STEEL SHALL MEET CAN/CSA G30.12-M-GRADE 400 AND SHALL BE IN THE FORM OF DEFORMED ROUND BARS.

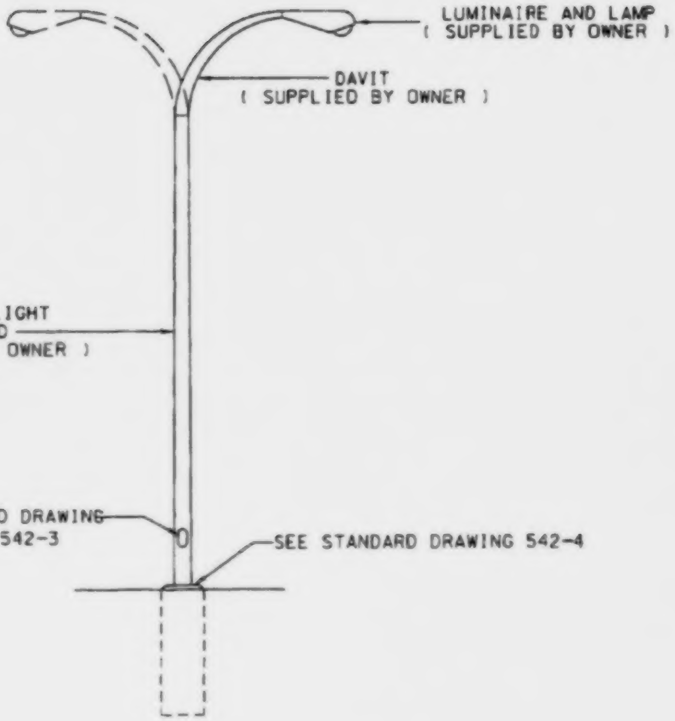
Sign or Light Base Detail
Bedrock Foundation


EDGE OF TRAVELLED ROADWAY
℄ OF ROADWAY
ANCHOR BOLTS ARE TO BE ALIGNED WITH THESE CENTRELINES
℄ OF BASES
93°
ANCHOR BOLTS
FLOW OF TRAFFIC
℄ OF BASE 3
℄ OF BASE 2
℄ OF BASE 1

NOTE:
REQUIRED NUMBER OF BASES
INDICATED ON SIGN SCHEDULE

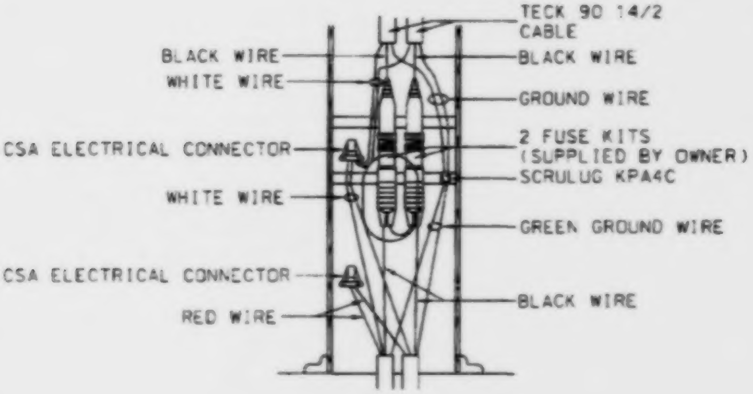
Angulation of Sign Foundations

File: 540-4

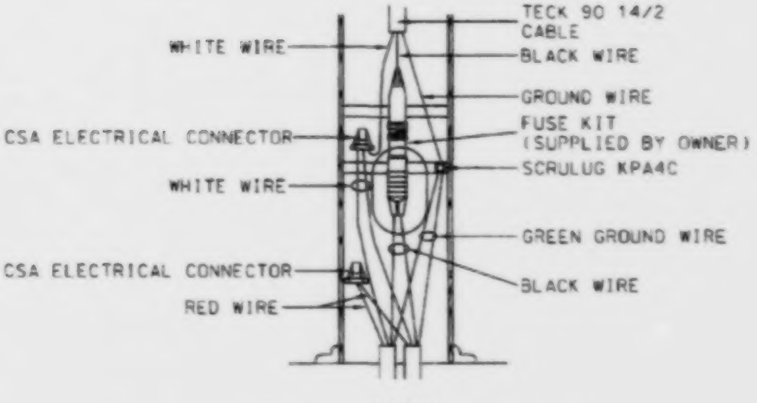

LUMINAIRE AND LAMP
(SUPPLIED BY OWNER)
DAVIT
(SUPPLIED BY OWNER)
ALUMINUM LIGHT
STANDARD
(SUPPLIED BY OWNER)
SEE STANDARD DRAWING
542-2 OR 542-3
SEE STANDARD DRAWING 542-4

Light Standard Detail
Single and Double Davit

File: 542-1


TECK 90 14/2
CABLE
BLACK WIRE
BLACK WIRE
WHITE WIRE
GROUND WIRE
CSA ELECTRICAL CONNECTOR
2 FUSE KITS
(SUPPLIED BY OWNER)
SCRULUG KPA4C
WHITE WIRE
GREEN GROUND WIRE
CSA ELECTRICAL CONNECTOR
BLACK WIRE
RED WIRE

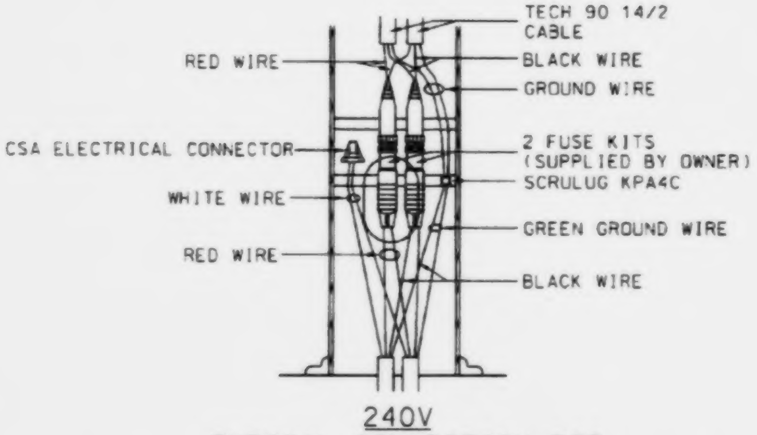
120V
TYPICAL CONNECTION FOR
DOUBLE DAVIT ALUMINUM LIGHT STANDARD


TECK 90 14/2
CABLE
WHITE WIRE
BLACK WIRE
GROUND WIRE
FUSE KIT
(SUPPLIED BY OWNER)
CSA ELECTRICAL CONNECTOR
SCRULUG KPA4C
WHITE WIRE
GREEN GROUND WIRE
CSA ELECTRICAL CONNECTOR
BLACK WIRE
RED WIRE

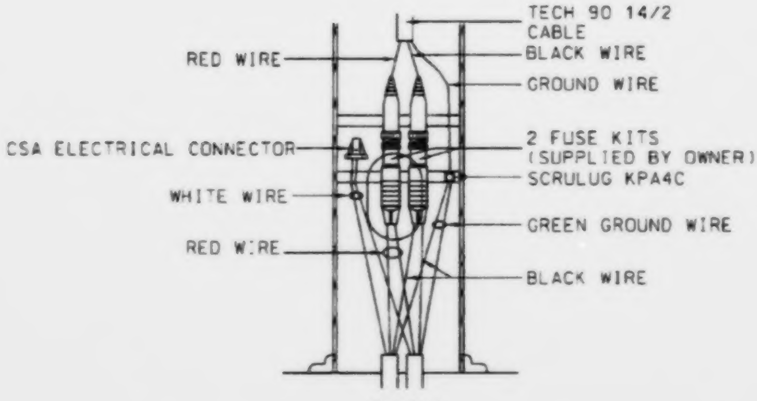
120V
TYPICAL CONNECTION FOR
SINGLE DAVIT ALUMINUM LIGHT STANDARD

Light Standard Wiring Details
120 volt

File: 542-2

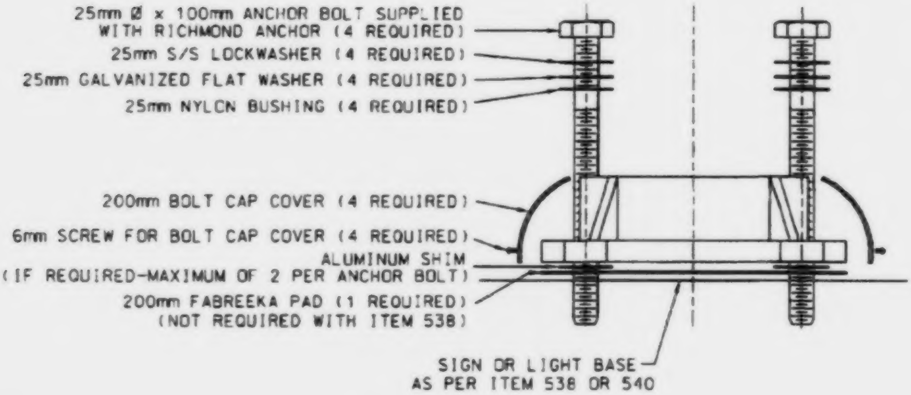

TECH 90 14/2 CABLE
RED WIRE
BLACK WIRE
GROUND WIRE
CSA ELECTRICAL CONNECTOR
2 FUSE KITS (SUPPLIED BY OWNER)
SCRULUG KPA4C
WHITE WIRE
GREEN GROUND WIRE
RED WIRE
BLACK WIRE

240V
TYPICAL CONNECTION FOR
DOUBLE DAVIT ALUMINUM LIGHT STANDARD

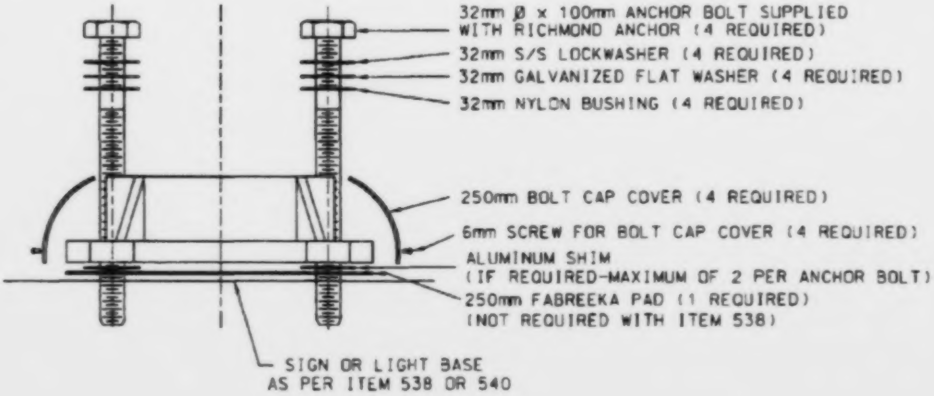

TECH 90 14/2 CABLE
RED WIRE
BLACK WIRE
GROUND WIRE
CSA ELECTRICAL CONNECTOR
2 FUSE KITS (SUPPLIED BY OWNER)
SCRULUG KPA4C
WHITE WIRE
GREEN GROUND WIRE
RED WIRE
BLACK WIRE

240V
TYPICAL CONNECTION FOR
SINGLE DAVIT ALUMINUM LIGHT STANDARD

Light Standard Wiring Details
240 volt


25mm Ø x 100mm ANCHOR BOLT SUPPLIED WITH RICHMOND ANCHOR (4 REQUIRED)
25mm S/S LOCKWASHER (4 REQUIRED)
25mm GALVANIZED FLAT WASHER (4 REQUIRED)
25mm NYLON BUSHING (4 REQUIRED)
200mm BOLT CAP COVER (4 REQUIRED)
6mm SCREW FOR BOLT CAP COVER (4 REQUIRED)
ALUMINUM SHIM (IF REQUIRED-MAXIMUM OF 2 PER ANCHOR BOLT)
200mm FABREEKA PAD (1 REQUIRED) (NOT REQUIRED WITH ITEM 538)
SIGN OR LIGHT BASE AS PER ITEM 538 OR 540

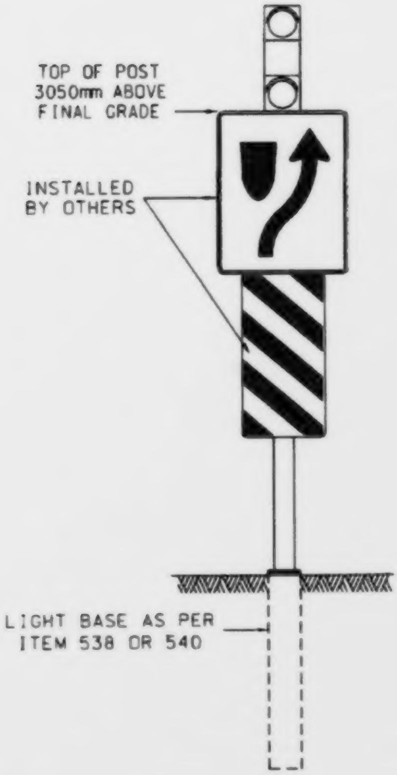
MATERIAL FOR A
9.1m AND 10.7m LIGHT STANDARD


32mm Ø x 100mm ANCHOR BOLT SUPPLIED WITH RICHMOND ANCHOR (4 REQUIRED)
32mm S/S LOCKWASHER (4 REQUIRED)
32mm GALVANIZED FLAT WASHER (4 REQUIRED)
32mm NYLON BUSHING (4 REQUIRED)
250mm BOLT CAP COVER (4 REQUIRED)
6mm SCREW FOR BOLT CAP COVER (4 REQUIRED)
ALUMINUM SHIM (IF REQUIRED-MAXIMUM OF 2 PER ANCHOR BOLT)
250mm FABREEKA PAD (1 REQUIRED) (NOT REQUIRED WITH ITEM 538)
SIGN OR LIGHT BASE AS PER ITEM 538 OR 540

MATERIAL FOR A
12.2m AND 13.7m LIGHT STANDARD

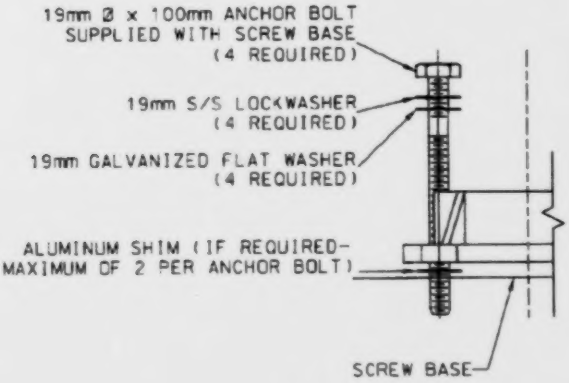
File: 542-4

Light Standard Anchor Details

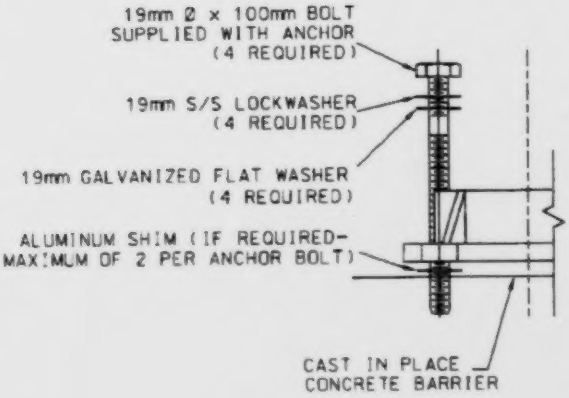

TOP OF POST 3050mm ABOVE FINAL GRADE
INSTALLED BY OTHERS
LIGHT BASE AS PER ITEM 538 OR 540

MEDIAN FLASHING LIGHT

SCREW BASE

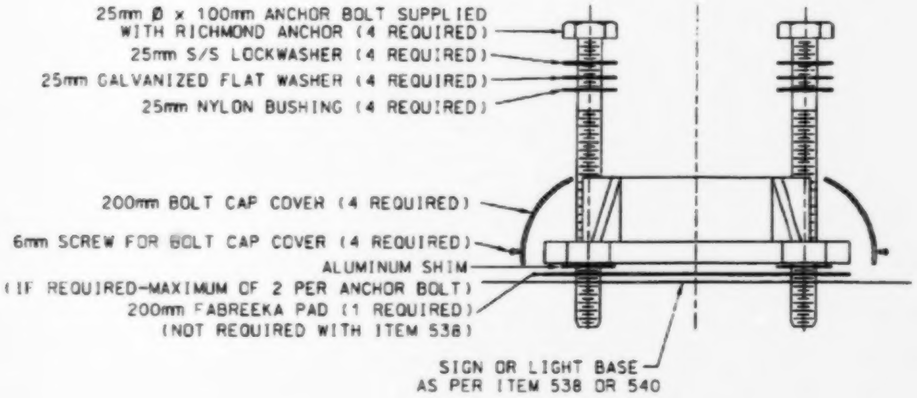

19mm Ø x 100mm ANCHOR BOLT SUPPLIED WITH SCREW BASE (4 REQUIRED)
19mm S/S LOCKWASHER (4 REQUIRED)
19mm GALVANIZED FLAT WASHER (4 REQUIRED)
ALUMINUM SHIM (IF REQUIRED- MAXIMUM OF 2 PER ANCHOR BOLT)
SCREW BASE

MEDIAN BARRIER

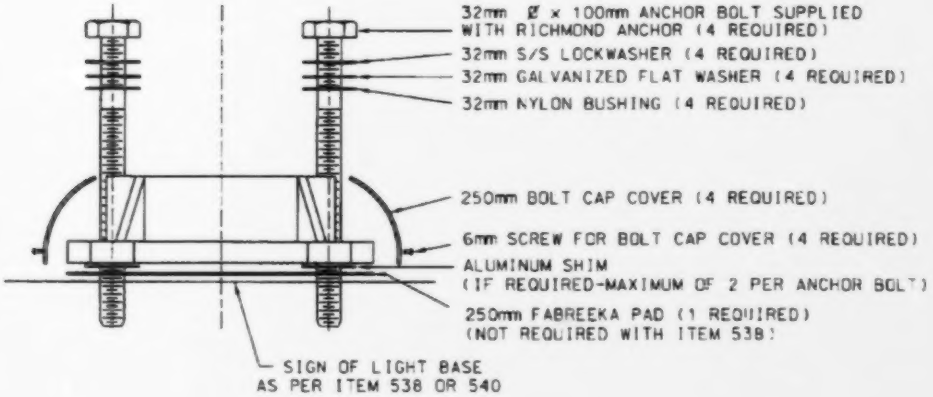

19mm Ø x 100mm BOLT SUPPLIED WITH ANCHOR (4 REQUIRED)
19mm S/S LOCKWASHER (4 REQUIRED)
19mm GALVANIZED FLAT WASHER (4 REQUIRED)
ALUMINUM SHIM (IF REQUIRED- MAXIMUM OF 2 PER ANCHOR BOLT)
CAST IN PLACE CONCRETE BARRIER

File: 544-1

Median Flashing Light Details


25mm Ø x 100mm ANCHOR BOLT SUPPLIED WITH RICHMOND ANCHOR (4 REQUIRED)
25mm S/S LOCKWASHER (4 REQUIRED)
25mm GALVANIZED FLAT WASHER (4 REQUIRED)
25mm NYLON BUSHING (4 REQUIRED)
200mm BOLT CAP COVER (4 REQUIRED)
6mm SCREW FOR BOLT CAP COVER (4 REQUIRED)
ALUMINUM SHIM (IF REQUIRED-MAXIMUM OF 2 PER ANCHOR BOLT)
200mm FABREEKA PAD (1 REQUIRED) (NOT REQUIRED WITH ITEM 538)
SIGN OR LIGHT BASE AS PER ITEM 538 OR 540

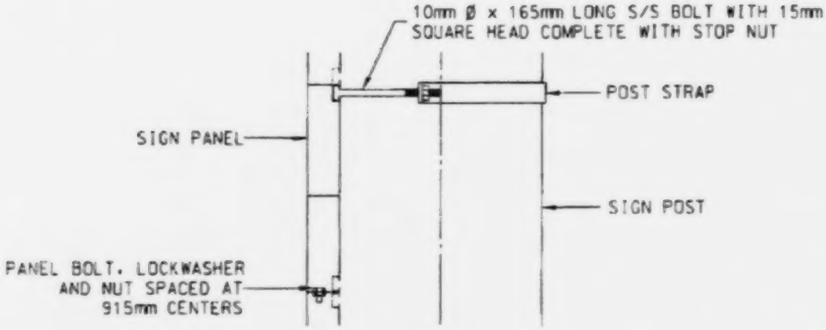
MATERIAL FOR A
200mm ALUMINUM SIGN POST


32mm Ø x 100mm ANCHOR BOLT SUPPLIED WITH RICHMOND ANCHOR (4 REQUIRED)
32mm S/S LOCKWASHER (4 REQUIRED)
32mm GALVANIZED FLAT WASHER (4 REQUIRED)
32mm NYLON BUSHING (4 REQUIRED)
250mm BOLT CAP COVER (4 REQUIRED)
6mm SCREW FOR BOLT CAP COVER (4 REQUIRED)
ALUMINUM SHIM (IF REQUIRED-MAXIMUM OF 2 PER ANCHOR BOLT)
250mm FABREEKA PAD (1 REQUIRED) (NOT REQUIRED WITH ITEM 538)
SIGN OF LIGHT BASE AS PER ITEM 538 OR 540

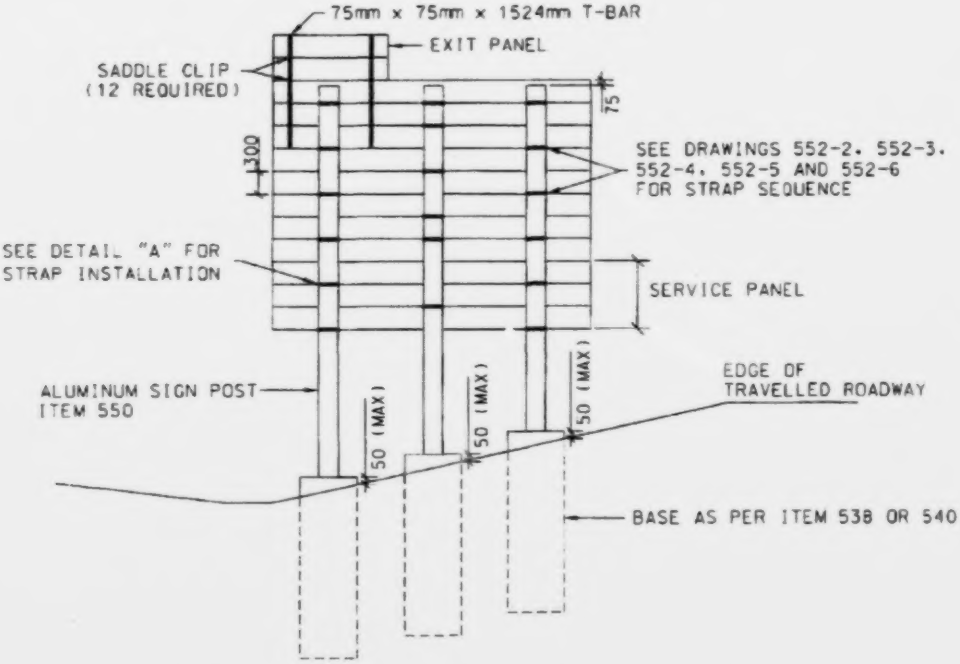
MATERIAL FOR A
250mm ALUMINUM SIGN POST

Roadside Sign Post Anchor Details

File: 550-1

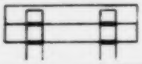
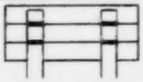
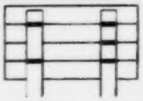
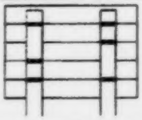
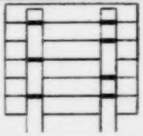
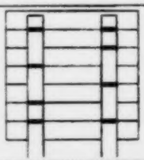
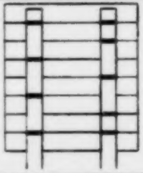
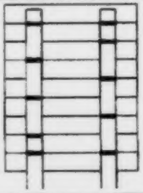

10mm Ø x 165mm LONG S/S BOLT WITH 15mm SQUARE HEAD COMPLETE WITH STOP NUT
POST STRAP
SIGN PANEL
SIGN POST
PANEL BOLT, LOCKWASHER AND NUT SPACED AT 915mm CENTERS

DETAIL "A"


75mm x 75mm x 1524mm T-BAR
EXIT PANEL
SADDLE CLIP (12 REQUIRED)
75
300
SEE DRAWINGS 552-2, 552-3, 552-4, 552-5 AND 552-6 FOR STRAP SEQUENCE
SEE DETAIL "A" FOR STRAP INSTALLATION
SERVICE PANEL
ALUMINUM SIGN POST ITEM 550
50 (MAX)
50 (MAX)
50 (MAX)
EDGE OF TRAVELLED ROADWAY
BASE AS PER ITEM 538 OR 540

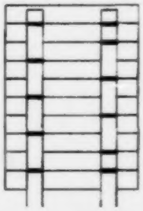
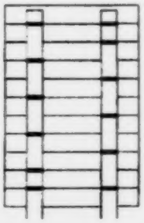
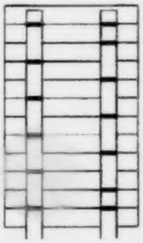
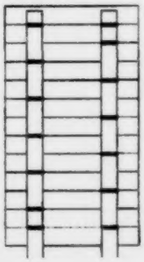
File: 552-1

Roadside Sign Details

Number of Sign Panels	Number of Straps on First Post	Number of Straps on Second Post	Strap Sequence for Two-Post Signs	Strap Sequence for Third and Fourth Post
2	2	2		Regardless of the number of panels, the strap sequence of the third post shall be the same as that of the first post and the strap sequence of the fourth post shall be the same as that of the second post.
3	2	2		
4	3	2		
5	3	3		
6	4	3		
7	4	4		
8	5	4		
9	5	5		

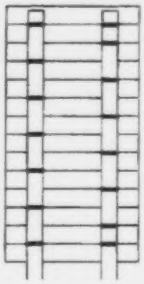
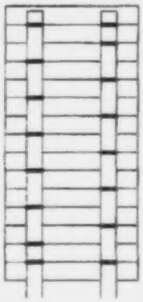
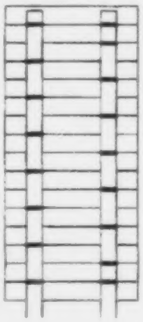
File: 552-2

Roadside Sign Strap Sequence

Number of Sign Panels	Number of Straps on First Post	Number of Straps on Second Post	Strap Sequence for Two-Post Signs	Strap Sequence for Third and Fourth Post
10	6	5		Regardless of the number of panels, the strap sequence of the third post shall be the same as that of the first post and the strap sequence of the fourth post shall be the same as that of the second post.
11	6	6		
12	7	6		
13	7	7		

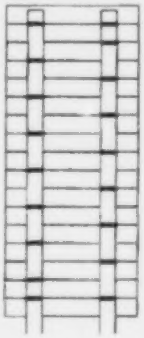
Roadside Sign Strap Sequence

File: 552-3

Number of Sign Panels	Number of Straps on First Post	Number of Straps on Second Post	Strap Sequence for Two-Post Signs	Strap Sequence for Third and Fourth Post
14	8	7		Regardless of the number of panels, the strap sequence of the third post shall be the same as that of the first post and the strap sequence of the fourth post shall be the same as that of the second post.
15	8	8		
16	9	8		

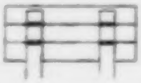
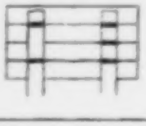
Roadside Sign Strap Sequence

File: 552-4

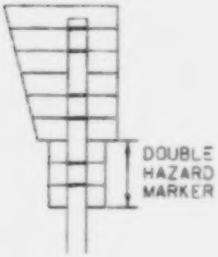
Number of Sign Panels	Number of Straps on First Post	Number of Straps on Second Post	Strap Sequence for Two-Post Signs	Strap Sequence for Third and Fourth Post
17	9	9		Regardless of the number of panels, the strap sequence of the third post shall be the same as that of the first post and the strap sequence of the fourth post shall be the same as that of the second post.

Roadside Sign Strap Sequence

File: 552-5

Number of Sign Panels	Number of Straps on First Post	Number of Straps on Second Post	Strap Sequence for Two-Post Signs	Strap Sequence for Third and Fourth Post
3	2	2		Regardless of the number of panels, the strap sequence of the third post shall be the same as that of the first post and the strap sequence of the fourth post shall be the same as that of the second post.
4	3	2		

ROADSIDE SIGN SERVICE PANEL STRAP SEQUENCE

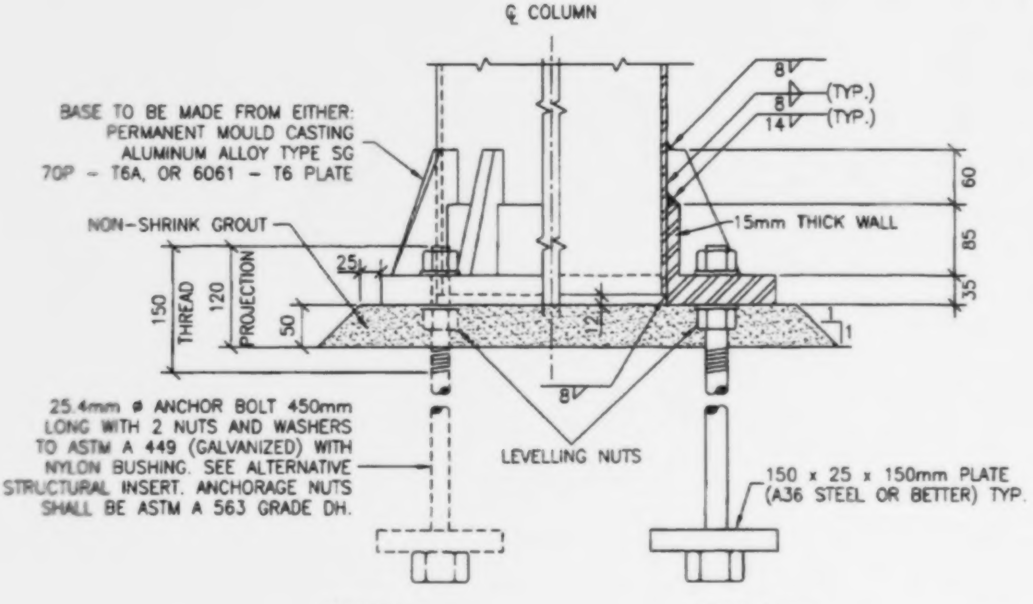


NOTE:
OTHER THAN THE GORE EXIT SIGN, ALL SIGNS INSTALLED ON SINGLE POSTS SHALL FOLLOW THE STRAP INSTALLATION OF THE FIRST POST FOR THE SPECIFIED NUMBER OF SIGN PANELS INSTALLED.

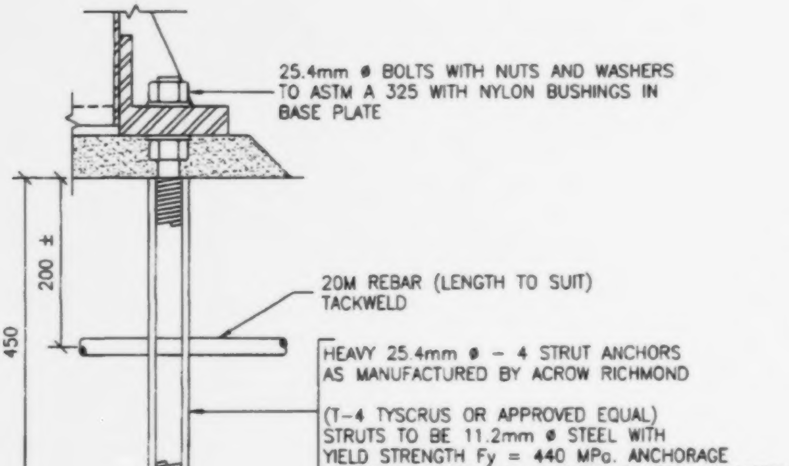
GORE EXIT SIGN STRAP SEQUENCE (SINGLE POST)

Roadside Sign Strap Sequence

File: 552-6

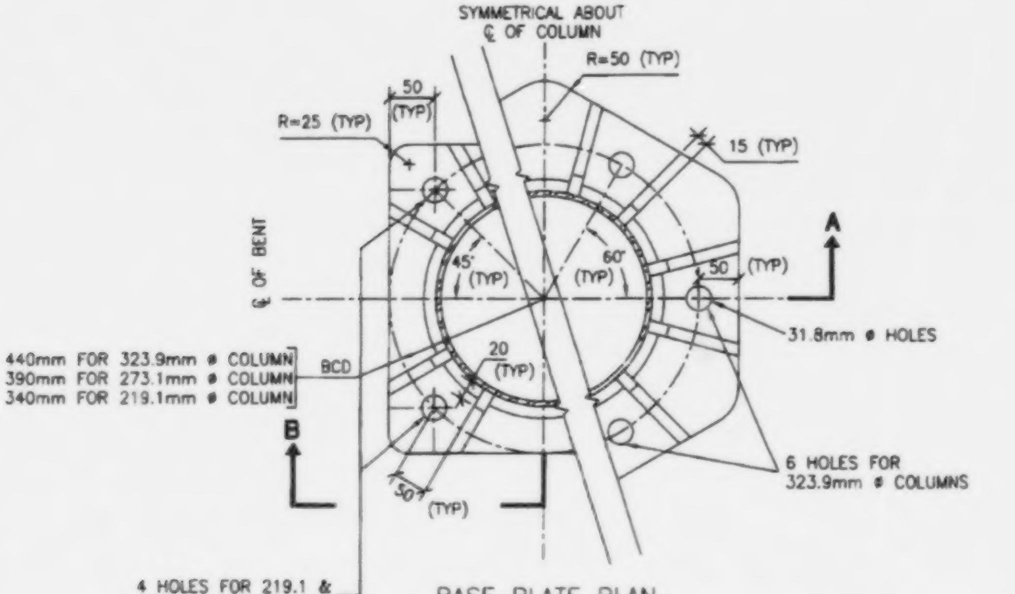

℄ COLUMN
8
8 (TYP.)
14 (TYP.)
BASE TO BE MADE FROM EITHER: PERMANENT MOULD CASTING ALUMINUM ALLOY TYPE SG 70P – T6A, OR 6061 – T6 PLATE
60
85
35
15mm THICK WALL
NON-SHRINK GROUT
25
150
THREAD
120
PROJECTION
50
12
1
1
8
25.4mm ø ANCHOR BOLT 450mm LONG WITH 2 NUTS AND WASHERS TO ASTM A 449 (GALVANIZED) WITH NYLON BUSHING. SEE ALTERNATIVE STRUCTURAL INSERT. ANCHORAGE NUTS SHALL BE ASTM A 563 GRADE DH.
LEVELLING NUTS
150 x 25 x 150mm PLATE (A36 STEEL OR BETTER) TYP.

SECTION B SECTION A

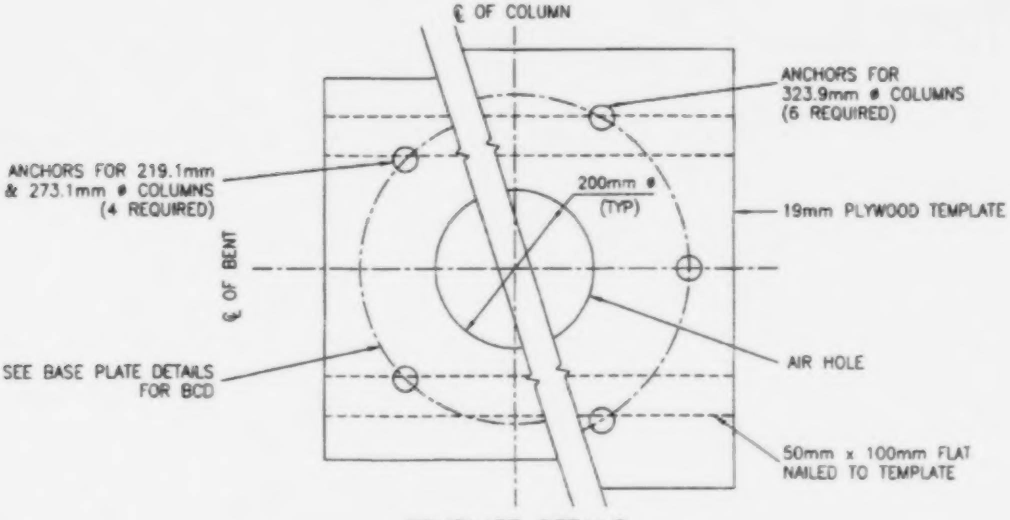

25.4mm ø BOLTS WITH NUTS AND WASHERS TO ASTM A 325 WITH NYLON BUSHINGS IN BASE PLATE
200 ±
450
20M REBAR (LENGTH TO SUIT) TACKWELD
HEAVY 25.4mm ø – 4 STRUT ANCHORS AS MANUFACTURED BY ACROW RICHMOND
(T-4 TYSCRUS OR APPROVED EQUAL) STRUTS TO BE 11.2mm ø STEEL WITH YIELD STRENGTH Fy = 440 MPa. ANCHORAGE INCLUDING BOLTS AND WASHERS TO BE GALVANIZED IN ACCORDANCE WITH ASTM A 153.

STRUCTURAL INSERT ANCHORAGE – ALTERNATIVE

Overhead Sign Structure Foundation Anchorage Details


SYMMETRICAL ABOUT
℄ OF COLUMN
R=50 (TYP)
50
(TYP)
R=25 (TYP)
15 (TYP)
℄ OF BENT
45°
(TYP)
60°
(TYP)
50
(TYP)
A
31.8mm ⌀ HOLES
440mm FOR 323.9mm ⌀ COLUMN
390mm FOR 273.1mm ⌀ COLUMN
340mm FOR 219.1mm ⌀ COLUMN
BCD
20
(TYP)
B
50
(TYP)
6 HOLES FOR
323.9mm ⌀ COLUMNS
4 HOLES FOR 219.1 &
273.1mm ⌀ COLUMNS

BASE PLATE PLAN


℄ OF COLUMN
ANCHORS FOR
323.9mm ⌀ COLUMNS
(6 REQUIRED)
ANCHORS FOR 219.1mm
& 273.1mm ⌀ COLUMNS
(4 REQUIRED)
200mm ⌀
(TYP)
19mm PLYWOOD TEMPLATE
℄ OF BENT
AIR HOLE
SEE BASE PLATE DETAILS
FOR BCD
50mm x 100mm FLAT
NAILED TO TEMPLATE

TEMPLATE DETAILS

Overhead Sign Structure Foundation
Base Plate and Template Details

DIVISION 600

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603	Filter Screen	2
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605	Erosion Control Structure	3
606	Removal of Erosion Control Structure	2
607	Gabions	3
608	Random Riprap	3
609	Rock Weir	1
610	Armour Stone Protection	3
611	Individual Rock Placement	1
612	Gravel for Fish Habitat	2
613	Topsoil	2
614	Hydroseeding	6
615	Fertilizing	2
616	Mulching	2
618	Trees and Shrubs	2
620	Temporary Water Barrier	2
621	Temporary Water Control Works	2
699	Standard Drawings:	

602 - 1 Sediment Control Fence
604 - 1 Jute Mat Details

ITEM	DESCRIPTION	NUMBER OF PAGES
605 - 1	Type A - Spillway Structure for Sediment Pond	
605 - 2	Type A - Spillway Structure Details	
605 - 3	Type B - Erosion Control Structure for Ditches	
605 - 4	Type B - Erosion Control Structure Details	
605 - 5	Type C - Erosion Control Structure for Ditches	
605 - 6	Type C - Erosion Control Structure Details	
605 - 7	Type D - Erosion Control Structure for Ditches	
607 - 1	Gabion Backfilling Details	
609 - 1	Rock Weir Details	
610 - 1	Armour Stone Protection System Details	

601.1 DESCRIPTION

.1 This Item consists of the supply and installation of geotextile.

601.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 The plastic yarn of the geotextile and the threads used in sewing operations shall consist of a long chain synthetic polymer composed of at least 85% by mass of propylene, ethylene, ester, amide or vinylidene-chloride, and shall contain stabilizers or inhibitors added to the base plastic to make the filaments resistant to deterioration by ultraviolet and heat exposure.

.3 Type N1, N2, N3 and N4 geotextile shall be a pervious sheet of non-woven plastic yarn.

.4 Type W1, W2 and W3 geotextile shall be a sheet of woven plastic yarn.

.5 The geotextile shall conform to the requirements as indicated in Table 601-1.

.6 The material shall be handled and protected as per the manufacturer's instructions and recommendations until incorporated into the Work.

.7 Thread for the seams shall be equal to or better than the geotextile in resistance to chemical and biological degradation and both factory and field sewn or sealed seams shall have a grab tensile strength equal to 90% of that of the geotextile.

601.3 SUBMITTALS

.1 The Contractor shall submit, in advance of the Work, a mill certificate for the geotextile to be supplied.

.2 The Contractor shall submit, upon request, the manufacturer's recommended procedures for installation and instructions for handling of the selected geotextile.

601.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The areas to be covered with geotextile shall be prepared by shaping the ground to present a uniform and regular surface free from bumps and depressions.

  .1 Geotextile shall not be placed on stumps, brush, limbs, ice or other material that may tear or puncture the fabric.

Table 601-1
Requirements Of Non-Woven And Woven Geotextiles

			Type Of Fabric						
Property (Note 1)	Unit	ASTM	N1	N2	N3	N4	W1	W2	W3
Tearing Strength (Trapezoid Method)	N	D4533	160	250	310	500	200	500	625
Grab Tensile Strength (Both Directions)	N	D4632	400	600	790	1200	400	1200	1500
Elongation At Break	%	D4632	50	50	50	50	25 max.	25 max.	25 max.
Apparent Opening Size	μm	D4751	50 to 250	50 to 250	50 to 250	50 to 250	840 max.	Note 2	Note 2
UV Degradation	% Ret.	D4355					70 min.	Note 2	Note 2
Permittivity	Sec $^{-1}$	D4491	1.75 to 3.50	1.25 to 2.75	1.00 to 2.50	1.00 to 2.50	0.01 min.	Note 2	Note 2
Thickness	mm								

Note 1 Values above the heavy line are Minimum Average Roll Values (MARV) and unless otherwise noted, values are minimum requirements.

Note 2 Special requirement defined in the Contract Documents.

601.4.2 .2 The geotextile shall be placed so as to create a surface that is smooth and free of tension stress, folds, wrinkles and creases.

.3 The manufacturer's installation procedures shall be the standard of installation that shall be applied except as follows:

.1 Where more than one width of fabric is used, the fabric shall be joined by sewing or by an overlap of at least 500 mm and all overlap joints shall be securely held in place.

601.4 .4 For Roadbed construction, at least 300 mm of fill material shall be kept between Equipment and fabric.

.1 In no case shall Equipment travel on uncovered fabric.

.5 The Contractor shall immediately repair damaged geotextile.

.1 The damaged area shall be covered with a patch of the same fabric type extending a minimum of one metre beyond the perimeter of the damaged area.

601.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of area covered with geotextile in accordance with this Item.

.2 Overlapped joints, patches and seams shall be measured as a single layer of fabric.

601.6 BASIS FOR PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of geotextile, as identified under the Contract.

SEDIMENT CONTROL FENCE

ITEM: 602

602.1 DESCRIPTION

.1 This Item consists of the supply, installation, maintenance and removal of a sediment control fence.

602.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 The fence may be prefabricated or constructed on site from the specified individual components.

.3 The fabric shall conform to the requirements of 601.2, Type W1, geotextile.

.4 Support posts are to be supplied as indicated on Standard Drawing 602-1.

602.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

602.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The sediment control fence shall be installed as indicated on the Standard Drawing 602-1 and prefabricated sediment control fence shall be installed as per the manufacturer's instructions.

  .1 In areas of potential sheet flow runoff where construction activity may cause the drainage run-off to transport sediment(s), and the Contract Documents do not provide for sediment control fences in these areas, the Contractor shall ensure that sediment control fences are properly located for effective runoff control.

  .2 The Contractor may install additional sediment control fences, after consultation and subsequent agreement with the Engineer as to the location and length.

.3 The Contractor shall carry out the Work in accordance with Item 948.

.4 The Contractor shall maintain the sediment control fence in a functional condition continuously from the time of installation until the completion of the Contract or removal.

.5 The Contractor shall inspect all sediment control fences after each rainfall and at least daily during periods of prolonged rainfall.

.6 The Contractor shall immediately repair any damage to sediment control fences or parts thereof.

602.4 .7 The Contractor shall remove retained sediment prior to it having accumulated to a level approximately but not exceeding one-half the height of the fence, and this sediment shall be disposed of at a location at least 30 m away from any watercourse, and in such a manner that the sediment will not be returned to the Work Area or the watercourse; or

.1 subject to the approval of the Engineer, the Contractor may install a second, back-up sediment control fence, at his own expense.

.8 The Contractor shall remove all sediment control fence and the time of such removal shall be subject to the Engineer's approval but in all cases shall occur prior to the completion of the Contract.

.1 Sediment control fence removed shall become the property of the Contractor and shall be disposed of outside the Work Site.

.2 If the Engineer notifies the Contractor in writing, prior to the completion of the Contract, that all or any part of the sediment control fence is to remain in place, the Contractor shall be deemed to have completed his obligations for that portion of the sediment control fence under this Item and the sediment control fence shall become the property of the Owner.

.9 At the time of removal, the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30 m from any watercourse, and in such a manner that the sediment will not be returned to the Work Area or the watercourse and shall dress and seed the area of the removed fence and sedimentation, to the satisfaction of the Engineer.

602.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of sediment control fence supplied, installed, maintained and removed in accordance with this Item.

602.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

603.1 DESCRIPTION

.1 This Item consists of the design, supply, installation, maintenance and removal of a filter screen.

603.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 The filter screen shall utilize, as a minimum requirement, geotextile meeting the requirements of 601.2, Type N4.

.3 The material shall be handled and protected as per the manufacturer's instructions and recommendations until incorporated into the Work.

603.3 SUBMITTALS

.1 The Contractor shall submit a detailed design in accordance with Item 956.

  .1 The purpose of the filter screen is to provide an effective barrier to sediment (silt and other fine particulate matter) from migration off site and is to be constructed in such a manner so as to be effective over the entire water depth.

  .2 The barrier must be able to withstand all natural forces and the predictable weather conditions specific to the site where installed.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

603.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work in accordance with Item 948.

.3 The Contractor shall construct the filter screen as per the design submitted under 603.3.1.

.4 The portion of the geotextile located along the bottom of the watercourse shall be held in place in such a manner that water cannot pass between the bottom line of the geotextile and the bed of the watercourse.

.5 The geotextile is to form a continuous sheet and the seams are to be constructed with materials and in a manner that conforms with the manufacturer's instructions.

.6 The Contractor shall maintain the filter screen in a functional manner throughout the period applicable.

603.4 .7 The Contractor shall remove from the watercourse all materials and associated Structures or related items, pertaining to the filter screen, following notification to and approval from the Engineer.

603.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of linear metres of filter screen designed, supplied, installed, maintained and removed in accordance with this Item.

603.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

604.1 DESCRIPTION

.1 This Item consists of the supply and installation of jute mats as a ditch liner.

604.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Jute mats shall be made of unbleached, loosely twisted jute yarn 3 to 5 mm in diamter, woven to mesh openings of approximately 20 mm.

.3 Mats shall be a minimum of 1.2 m in width and shall have an average unit shipping weight of 500 g/m^2.

.4 Staples shall have the approximate dimensions as indicated on Standard Drawing 604-1.

604.3 SUBMITTALS

.1 The Contractor shall submit, upon request, the manufacturer's certification that the materials being supplied meet the specified requirements.

.2 The Contractor shall submit the manufacturer's recommended procedures for installation of the materials.

.3 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

604.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Jute Mats shall be installed as indicated on Standard Drawing 604-1 and in accordance with the manufacturer's procedures.

.3 Jute mats shall be installed along the full length of the prepared ditches the same day on which erosion structures are removed.

.4 Staples shall be driven perpendicular to the ground in an approved pattern and finished flush with the ground, such that the mats are secured in uniform contact with the ground.

604.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment will be the number of square metres of jute mats supplied and installed in accordance with this Item.

.2 Overlapped joints, patches and seams will be measured as a single layer.

604.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

605.1 DESCRIPTION

.1 This Item consists of the supply, construction and maintenance of an erosion control structure.

605.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Geotextile shall be supplied in accordance with the requirements of 601.2, Type N1.

.3 Random riprap shall be supplied in accordance with the requirements of 608.2 and may consist of rock from the Work Site.

.4 Fill material shall be obtained from within the limits of the excavation and shall be of a gradation capable of forming an impermeable dike when compacted, unless otherwise directed by the Engineer.

605.3 SUBMITTALS

.1 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

605.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Erosion control structures shall be constructed, to the dimensions as indicated on Standard Drawings 605-1 to 605-7.

.3 Erosion control structures may be installed in natural swales prior to ditch construction, in temporary or partially constructed ditches, and/or in completed ditches.

  .1 The Contractor may construct additional erosion control structures, after consultation and subsequent agreement with the Engineer as to the location and type.

  .2 In areas of potential sheet flow runoff where construction activity may cause the drainage run-off to transport sediment, and the Contract Documents do not provide for erosion control structures in these areas, the Contractor shall ensure that erosion control structures are properly located for effective runoff control.

.4 The Contractor shall carry out the Work in accordance with Item 946 and Item 948.

.5 The application, construction details and maintenance requirements shall be carried out as indicated in Table 605-1.

Table 605-1
Erosion Control Structures

Type	Application	Construction Details	Maintenance
"A"	Type A structures shall be installed as spillways of dykes that are built to pond runoff from ditches or from grubbed areas, or at the end of a cut where runoff leaves the ditch to flow down a natural slope.	Standard Drawings 605-1 and 605-2	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 300 mm of the crest of the spillway.
"B"	Type B structures are typically installed in rock ditches where stakes required for Type C and D structures cannot be driven.	Standard Drawings 605-3 and 605-4	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 100 mm of the crest of the notch.
"C"	Type C structures are typically installed in earth ditches or swales.	Standard Drawings 605-5 and 605-6	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 100 mm of the crest of the notch.
"D"	Type D structures are typically installed in earth ditches or swales.	Standard Drawing 605-7	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 100 mm of the crest of the notch.

605.4 .6 Erosion control structure(s) shall be maintained, including the removal of retained sediment deposits, in such a manner that the underlying geotextile and ground receive minimal disturbance.

.7 The Contractor shall maintain erosion control structure(s) in a functional condition continuously from the time of installation until such time as the grass on seeded Slopes is established to be an effective erosion deterrent or until the completion of the Contract as directed by the Engineer.

.8 The Contractor shall inspect all erosion control structure(s) after each rainfall and at least daily during periods of prolonged rainfall.

.9 The Contractor shall immediately repair any damage to erosion control structure(s) or parts thereof.

.10 The Contractor shall dispose of the excavated sediment at a location, at least 30 m away from any watercourse, and in such a manner that the sediment will not be returned to the Work Area or watercourse.

.11 The Contractor shall not remove any erosion control structure without the authorization of the Engineer.

605.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of erosion control structure(s) that are supplied, constructed and maintained in accordance with this Item.

605.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of erosion control structure, as identified under the Contract.

REMOVAL OF EROSION CONTROL STRUCTURE ITEM: 606

606.1 DESCRIPTION

.1 This Item consists of the removal of an erosion control structure.

606.2 MATERIALS

.1 None identified.

606.3 SUBMITTALS

.1 None identified.

606.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Scheduling of the removal of the erosion control structures shall be subject to the approval of the Engineer.

  .1 Erosion control structures removed shall become the property of the Contractor and shall be disposed of outside the Work Site.

  .2 If the Engineer notifies the Contractor in writing, prior to the completion of the Contract, that all or any of the erosion control structure(s) are to remain in place, the Contractor shall be deemed to have completed his obligations for that portion of the Work under this Item and the erosion control structure(s) indicated shall become the property of the Owner.

.3 At the time of removal, the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30 m from any watercourse, and in such a manner that the sediment will not be returned to the Work Area or the watercourse.

.4 The Contractor is to ensure that all possible care is taken to ensure that ground disturbance is maintained at a minimum during the erosion control structure removal operation and that all necessary precaution is taken to ensure that no sediment release occurs as a result of this removal activity.

.5 The Contractor shall be responsible to match the affected ditches and Slopes with the Slopes and ditch grades of the adjacent Work Area(s).

.6 The Contractor shall restore the area of the removed erosion control structure, deposited sedimentation and other disturbed ground within the Work Area, in accordance with Items 614 and/or 616, and to the satisfaction of the Engineer within 48 hours following the removal of the erosion control structure.

606.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of erosion control structure(s) removed in accordance with this Item.

606.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of erosion control structure, as identified under the Contract.

607.1 DESCRIPTION

.1 This Item consists of the supply and installation of gabion baskets fabricated from wire mesh and filled with rock.

607.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Gabion baskets shall be fabricated of galvanized wire mesh.

 .1 Fasteners to secure the baskets shall be supplied in a material compatible with the material type and properties of the basket.

.3 Rocks used in the construction of gabions shall be clean, hard, sound and durable, with the least dimension of any rock equal to or greater than one and one-half times the mesh size, and shall not exceed 300 mm in greatest dimension.

 .1 Rock used for basket fill material, when tested by Los Angeles Abrasion test method in accordance with ASTM C131 and/or C535, shall have an abrasion loss not greater than 40%.

 .2 Rocks shall be of a size that at least two layers of overlapping rock are required to fill the gabion.

.4 Geotextile shall be supplied in accordance with the requirements of 601.2, Type N1.

.5 Gabion baskets shall conform to the following minimum standards:

 .1 Factory fabricated so that the sides, ends, lid and internal diaphragms can be readily assembled at the Work Area into rectangular baskets of the sizes indicated in the Contract Documents.

 .2 When the length exceeds horizontal width, diaphragms of the same mesh as the gabion basket walls shall be used to divide the basket into equal cells of a length not in excess of the horizontal width.

 .3 Wire mesh shall be a uniform regular pattern, with a maximum nominal opening size of 80 by 100 mm, and fabricated to be non-ravelling.

 .4 Selvedge edges of the mesh shall be securely fastened together so that the joints, which are formed, are as strong as the body of the mesh.

 .5 Hot dip galvanized wire shall have a minimum coverage of 260 g/m^2 and shall conform to ASTM Tests: A641, A90, and A764.

 .6 Wire shall be dimensioned, as a minimum, as indicated in Table 607-1.

Table 607-1
Minimum Twisted Galvanized Wire Dimensions

Application	Diameter
Mesh	2.95 mm
Selvedges	3.80 mm
Binding	2.20 mm
Interlocking Wire Fasteners	3.17 mm

607.2 .6 The Contractor shall supply free draining backfill behind the gabion Structure in accordance with 366.2.

607.3 SUBMITTALS

.1 The Contractor shall submit, in advance of the Work, a mill certificate for the gabion materials to be supplied.

.2 The Contractor shall submit, upon request, the manufacturer's recommended procedures for installation and instructions for handling of the selected gabion.

.3 The Contractor shall notify the Engineer, in writing, for approval of the source of supply of rock, at least 14 Days in advance of obtaining material from the source proposed.

.4 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

607.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall prepare the area to receive the gabions in accordance with 161.4 and the Contract Documents.

.3 The Contractor shall place the gabions on a prepared rock and/or compacted soil foundation grade and shall assemble the gabions according to the manufacturer's instructions and recommendations.

.4 The gabion baskets in any row shall be filled in stages to minimize void spaces and so that local deformations are avoided.

.5 The rock for the exposed rock face(s) of the gabion basket shall be hand placed to ensure proper alignment and a neat, compact, square appearance.

.6 Bulges in the gabions shall not exceed 40 mm at the most extreme point measured in any cell.

607.4 .7 The geotextile shall be placed in accordance with 601.4.

.8 The Contractor shall backfill the areas behind gabion Structure in accordance with 366.4 and to the lines indicated on the Standard Drawing 607-1.

607.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the volume in cubic metres of gabions, supplied and installed in accordance with this Item.

607.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

608.1 DESCRIPTION

.1 This Item consists of supply and placing of random riprap.

608.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Random riprap materials shall be a well-graded mixture and shall Conform to the grading limits shown in Table 608-1.

.3 Random riprap for each rock shall have both thickness and breadth greater than or equal to one-third of its length.

.4 Random riprap shall consist of clean, hard, sound, durable rock, having a density of not less than 2.6 t/m^3.

  .1 Rock when tested by the Micro-Deval test method in accordance with MTO LS - 618, shall have a Micro-Deval loss not greater than 35%.

  .2 Rock when tested by the Freeze/Thaw test method in accordance with MTO LS - 614, shall have a Freeze/Thaw loss not greater than 15%.

.5 Random riprap used for Backslope stabilization or in erosion control structures may have a Micro-Deval loss not greater than 70% and a Freeze/Thaw loss not greater than 30%.

.6 Acceptability of the rock will be determined by the Owner's service records and/or by laboratory and/or field testing procedures carried out by qualified personnel.

.7 Random Riprap Mixed

  .1 Random riprap mixed shall be noted in the Contract Documents as R-# mixed and shall consist of a random riprap material of the designated size (R-#) thoroughly mixed with a gravel which shall conform to the requirements of 201.2.4.3.

    .1 Finely shattered rock which Conforms to the requirements of 608.2.4, 608.2.4.1, and 608.2.4.2 may be substituted for gravel, subject to the approval of the Engineer.

  .2 The Contractor shall produce a consistent mixed homogeneous blended supply of the specified mixture mixed at the proportion of approximately 20% by weight to the random riprap material indicated, to form a very dense material.

608.3 SUBMITTALS

.1 The Contractor shall notify the Engineer, in writing, for approval of the source of supply of rock or gravel/finely shattered rock materials, at least 14 Days in advance of obtaining material from the proposed source.

Table 608 - 1
Random Riprap Grading Limits

Mass	Size (Note 1)	Finer by Mass (%)								
(kg)	(mm)	R-A (Note 2)	R-5	R-25	R-50	R-100	R-250	R-500	R-1000	R-2000
6000	1600									100
4000	1400									70 -90
3000	1300								100	
2000	1100								70 - 90	40 - 55
1500	1000							100		
1000	900							70 - 90	40 - 55	
750	820						100			
500	710						70 - 90	40 - 55		
300	600					100				
250	570						40 - 55			
200	530					70 - 90				0 - 15
150	480				100					
100	420				70 - 90	40 - 55			0 - 15	
75	380			100						
50	330			70 - 90	40 - 55			0 - 15		
25	260			40 - 55			0 - 15			
15	220	100	100							
10	190		70 - 90			0 - 15				
5	150		40 - 55		0 - 15					
2.5	120	0		0 -15						
0.5	70		0 -15							
Thickness (mm) (Note 3)		300	300	500	600	800	1100	1400	1600	2200

Note 1	Approximate diameter (for information only)
Note 2	Random riprap for abutment and slope protection
Note 3	Measured perpendicular to the prepared surface

608.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall clear the Work Area of all driftwood, debris, snow, ice, and other objectionable materials.

.3 Control of the gradation shall be by visual examination.

  .1 Differences in opinion between the Engineer and the Contractor shall be resolved by testing in accordance with ASTM D5519.

  .2 The Contractor shall provide the Equipment, a sorting site and the labour required to undertake the testing required.

.4 The Contractor shall place random riprap material such that the underlying materials and any abutting Structures are not damaged.

  .1 The Contractor shall be responsible, at his own expense to repair any such damage to the Work.

.5 The Contractor shall tamp random riprap mixed during placement.

608.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of random riprap supplied and placed in accordance with this Item.

608.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each gradation of random riprap, as identified under the Contract.

.2 Cost of the provision of materials, labour and Equipment to test the random riprap to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the material does not meet the specified gradation, otherwise the Owner shall bear the cost of the test.

  .1 Cost of any retesting to resolve the supply of the specified material gradation shall be borne by the Contractor.

609.1 DESCRIPTION

.1 This Item consists of the supply and installation of a Rock Weir.

609.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Individual rocks shall have approximate dimensions as indicated on Standard Drawing 609-1.

  .1 Rocks shall be clean, hard, sound and durable and shall meet the following test requirements:

    .1 Micro-Deval loss not greater than 35% (MTO LS618).

    .2 Freeze-Thaw loss not greater than 25% (MTO LS614).

  .2 Rocks with visible planes of weakness and/or marked deterioration by water or weather will not be accepted.

.3 Random Riprap R-50 Mixed shall conform to Item 608.2.

609.3 SUBMITTALS

.1 The Contractor shall submit upon request to the Engineer for approval of the source of supply of rock, at least 14 Days in advance of obtaining material from the source proposed.

.2 Submittals are required in accordance with any cross-referenced Item forming part of this Item.

609.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Rock Weirs shall be constructed in accordance with Standard Drawing 609-1.

609.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment will be the number of Rock Weirs constructed in accordance with this Item.

609.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

610.1 DESCRIPTION

.1 This Item consists of supply and placing of the armour stone protection system.

610.2 MATERIALS

.1 All materials shall be supplied by the Contractor for both armour stone and filter blanket, in the specified size range by mass of individual rock or gradation limit, as indicated in the Contract Documents.

.2 The armour stone protection shall be rock that is clean hard, sound, durable, resistant to weathering and degradation in water, free of Overburden, spoil, shale and organic material and having a density of not less than 2.6 t/m^3.

  .1 The rock, when tested by the Micro-Deval test method in accordance with MTO LS - 618, shall have a Micro-Deval loss not greater than 35%.

  .2 When tested by the Freeze/Thaw test method in accordance with MTO LS - 614, the rock material shall have a Freeze/Thaw loss not greater than 15%.

.3 Individual rock shall be angular and each rock shall have both thickness and breadth greater than or equal to one-half of its length.

.4 Rock with visible planes of weakness and/or subject to marked deterioration by water or weather will not be accepted.

.5 The acceptability of the rock will be determined by the Owner's service records and/or by laboratory and/or field testing procedures carried out by qualified personnel.

.6 The approval of some rock fragments does not convey the Engineer's approval of all rock fragments to be obtained at that quarry.

610.3 SUBMITTALS

.1 The Contractor shall notify the Engineer, in writing, for approval of the source of supply of rock, at least 14 Days in advance of obtaining material from the source proposed.

610.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall place armour stone protection system (comprised of the composite of armour stone and filter blanket material) as indicated in the Contract Documents and/or in accordance with the Standard Drawing 610-1.

610.4 .3 The Contractor shall verify the existing grades and shall notify the Engineer if reshaping is required.

.4 The Contractor shall maintain the grades and Slopes of the underlying material to ensure that the Work Area is cleared of all driftwood, debris, snow, ice and all other objectionable materials in the area of the Work.

  .1 The armour stone protection shall be placed in conjunction with the construction of the embankment, so that the embankment is fully protected as soon after placement as practical.

.5 Control of the gradation shall be by visual examination.

  .1 Any difference in opinion between the Engineer and the Contractor shall be resolved by testing in accordance with ASTM D5519.

  .2 The Contractor shall provide the Equipment, a sorting site and the labour required to undertake the testing required.

.6 The Contractor shall place the armour stone protection such that the underlying materials and any abutting Structures are not damaged.

  .1 The Contractor shall be responsible, at his own expense to repair any such damage to the Work.

.7 Armour stone protection shall be placed such that each rock is stable, secure and supported by rocks below and the placement shall be controlled to ensure that a uniform and continuous cover results.

  .1 The Contractor shall ensure that during placement the larger rocks shall be dispersed throughout the entire armour stone protection mass.

  .2 The Contractor shall place the individual rock in such a manner that the whole structure will be bound and consolidated to as great an extent as the nature of the rock will allow.

.8 No pushing or dumping of armour stone protection shall be permitted during placement.

.9 The Contractor shall be responsible for any Work or materials required to repair damage which is a result of waterlevel variations, waves or weather conditions.

610.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of the armour stone protection system supplied and placed in accordance with this Item.

610.6 BASIS OF PAYMENT

.1 Payment for Work under this Item include a separate Unit Price for each armour stone protection system, as identified under the Contract.

.2 The cost of the provision of materials, labour and Equipment to test the armour stone protection to resolve disagreement between the Owner and the Contractor shall be borne by the Contractor if the test results show that the material does not meet the specified gradation, otherwise the Owner shall bear the cost of the test.

  .1 The cost of any retesting to resolve the supply of the specified material gradation shall be borne by the Contractor.

611.1 DESCRIPTION

.1 This Item consists of the supply and placing of individual rocks.

611.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

  .1 The rocks may be made available from the Work Site at the location(s) of their origin or production.

.2 The material shall be rocks that are hard, sound, durable, resistant to weathering and degradation in water and free of deleterious materials.

.3 Individual rocks shall be typically 600 mm ± 100 mm long and shall have both the thickness and breadth greater than or equal to one-half of their length.

611.3 SUBMITTALS

.1 The Contractor shall notify the Engineer, for approval, of the source(s) of supply, prior to the supplying of any material from the source(s) identified.

611.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall ensure that the placement of individual rocks does not disturb the underlying or surrounding material.

611.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of individual rocks placed in accordance with this Item.

611.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

612.1 DESCRIPTION

.1 This Item consists of the supply and placement of gravel for fish habitat.

612.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Gravel for fish habitat shall consist of a well graded granular material composed of clean, uncoated particles free of clay, silt or other deleterious materials and when tested in accordance with ASTM C136 and shall conform to the gradation limits presented in Table 612-1.

Table 612-1
Gradation Limits for Gravel for Fish Habitat

ASTM Sieve Size	Percent Passing
125 mm	100
100 mm	85 - 90
50 mm	60 - 75
16 mm	20 - 45
9.5 mm	15 - 35
1.18 mm	0 - 3

612.2 .3 Gravel for fish habitat shall show a Micro-Deval loss of not greater than 35%, when tested in accordance with MTO LS - 618.

.4 Gravel from the existing streambed may be used in the Work, if identified in the Contract Documents as being available.

612.3 SUBMITTALS

.1 The Contractor shall notify the Engineer, in writing, for approval of the source of gravel, at least 14 Days in advance of obtaining material from the source proposed.

.2 The Contractor shall submit verification that the material meets the specified requirements prior to the commencement of the Work.

612.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall adhere to the following construction practices, as a minimum standard, when conducting salvage of existing streambed materials:

  .1 Streambed material shall only be taken from areas of the existing watercourse which are being abandoned and are identified in the Contract Documents.

  .2 All salvage activity shall occur in the dry and in areas separated from the existing stream flow by environmentally accepted and approved techniques.

  .3 The Contractor shall be responsible for the salvage area and shall leave the salvage area in a clean, neat and environmentally acceptable condition.

612.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of tonnes of gravel for fish habitat supplied and placed in accordance with this Item.

612.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

613.1 DESCRIPTION

.1 This Item consists of the placement of topsoil, either available on site or including the supply from an off site source.

613.2 MATERIALS

.1 Topsoil shall be material salvaged and stockpiled under Item 106 and 107.

  .1 If additional material is required beyond that available on the Work Site, the Contractor shall obtain that material from outside the Work Site.

.2 Topsoil composition shall consist of 20 to 70% sand and contain 2 to 10% organic matter by weight.

.3 Topsoil shall be free of debris and stones larger than 75 mm in greatest dimension and large clods, roots and any other coarse vegetative material, of a size equal to or greater than the thickness of the layer of topsoil to be placed.

  .1 In areas of lawn restoration, topsoil shall be free of debris and stones larger than 25 mm in greatest dimension.

613.3 SUBMITTALS

.1 The Contractor shall notify the Engineer of the source(s) of topsoil to be obtained from outside the Work Site, at least 7 Days prior to importing material from off site.

613.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Areas to be topsoiled shall be scarified or otherwise loosened to a depth of at least 50 mm within 1 Day preceding the placement of topsoil.

.3 Topsoil placement in the Work Area shall be completed prior to the placement of any Roadbed materials above Subgrade, unless otherwise approved by the Engineer.

.4 Topsoil shall be spread on the prepared area(s) to a depth of 100 mm ± 25 mm and shall be brought to a true and even surface meeting the required grade.

  .1 Hand placement and raking shall be required in areas adjacent to finished lawns or in areas of restricted access.

  .2 In areas of lawn restoration, topsoil shall be rolled using a lawn roller or approved equivalent.

613.4 .5 Placing of topsoil shall not be carried out on frozen materials or when materials are wetted to such a degree that balling and clumping results.

.6 Topsoil shall not be placed after the end of the week in which September 30th occurs without prior approval of the Engineer.

.7 Topsoil that is contained within the Work Site that can be or has been salvaged shall be used prior to importing topsoil.

  .1 The Contractor shall incorporate imported topsoil into the Work only after receiving written authorization from the Engineer.

.8 If excess topsoil material exists after completion of the Work, this material shall remain the property of the Owner.

613.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the number of square metres of topsoil placed in accordance with this Item.

.2 The area shall be measured along the slope of the ground.

613.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

614.1 DESCRIPTION

.1 This Item consists of supply and application of hydroseeding on Foreslopes, Backslopes, ditches and other prepared areas.

.2 Hydroseeding shall be identified by the following mix designations:

  .1 Roadside Mix with no Mulch per 616.4 - Hydroseeding "A"

  .2 Municipal Mix with no Mulch per 616.4 - Hydroseeding "AM"

  .3 Roadside Mix with Mulch per 616.4 - Hydroseeding "B"

  .4 Municipal Mix with Mulch per 616.4 - Hydroseeding "BM"

  .5 Roadside Mix with Bonded Fibre matrix - Hydroseeding "C"

614.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Seed mix shall be as indicated in Table 614-1, except that for lawns and other areas identified by the Engineer, the seed mix shall be as indicated in Table 614-2.

Table 614-1
Composition of Roadside Mix

Species	Seed Mix % By Mass
Creeping Red Fescue	40
Hard Fescue	20
Canada Bluegrass	15
Alsike or White Clover	5
Annual Ryegrass	15
Red Top	5

Table 614-2
Composition of Municipal Mix

Species	Seed Mix% By Mass	
	Alternative 1	Alternative 2
Kentucky Bluegrass	50	40
Creeping Red Fescue (Turf Type)	30	40
Annual Ryegrass	20	20

614.2.2 .1 Additional alternatives to the municipal seed mix may be approved by the Engineer.

.2 The seed mixes for Tables 614-1 and 614-2 shall meet or exceed the requirements of the Canada Seeds Act for Canada No. 1 Ground Cover Mixture and Canada No. 1 Lawn Grass Mixture, respectively.

.3 Fertilizer shall be a 15-25-15 (N-P-K) mix for seeding done May 1st to Labour Day and 10-20-20 (N-P-K) thereafter.

.4 Bags of seed and fertilizer shall be labelled, identifying mass (kg), mix components and percentages, date of bagging and supplier's name.

.1 Bags of seed shall also be marked with lot number.

.5 Seed and fertilizer shall be kept dry and protected from direct sunlight and other detrimental conditions.

.1 Seed and fertilizer that have been subjected to moisture shall not be used.

.6 Binder may be supplied in liquid, flake or powder form.

.7 Water shall be free of any impurities which would inhibit germination of the seed.

.8 Hydraulic mulch shall be a product made primarily for use in hydroseeding, and shall consist of shredded wood fibres, shredded newsprint coloured green with an environmentally acceptable dye, or shredded straw mixed with raw cotton fibres and/or shredded newsprint.

.1 Hydraulic mulch shall form a homogeneous slurry when agitated or mixed in water with the other specified materials and shall contain no growth-inhibiting chemicals or compounds.

.2 Only straw mulch 616.2 shall be used for Hydroseeding BM.

.9 Mulch for Hydroseeding C shall be Soil Guard bonded fibre matrix or equivalent, consisting of the following materials and percentages by mass:

Long-strand wood fibres	88%
Organic tackifiers	10%
Mineral bonding agents	2%

.1 Fibre matrix shall be 100% biodegradable, compatible with the environment, and contain no germination-inhibiting components.

.10 When applied, the hydoseeding mix shall be capable of forming an absorptive mat, which will allow moisture to percolate into the underlying soil.

614.3 SUBMITTALS

.1 The Contractor shall submit, upon request, the manufacturer's and/or supplier's certification that the materials supplied meet the specified requirements as detailed in the Contract Documents.

.2 The Contractor shall submit, upon request, a Certificate of Analysis for the seed mix identifying the component species and percentages, including weed and inert material content. This submission shall include the location(s) where the lot(s) of seed to be used on the Contract may be sampled by the Engineer.

.3 The Contractor shall submit the proposed binder application rate in conjunction with 614.3.1.

.4 The Contractor shall submit, for application of Hydroseeding C, verification from the bonded fibre matrix manufacturer that he or his subcontractor is certified to carry out the Work.

614.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Areas to be hydroseeded shall be free of ruts, ridges and deleterious materials such as weeds, sticks, roots and large rocks which would impede growth of the seed mix and mowing.

  .1 Stones greater than 75 mm in the least dimension shall be removed and disposed of outside the Work Area.

.3 Final shaping of Slopes and other exposed earth surfaces shall be done in areas of cut and fill, as portions of the Work are completed, to enable hydroseeding to be done in stages in accordance with Item 946.

.4 The Contractor shall ensure all such areas are prepared to a loosened condition to a minimum depth of 25 mm no sooner than 2 Days prior to hydroseeding.

  .1 Hydroseeding will not be permitted on hardened, crusted or rutted soil.

.5 Hydraulic mulch, seed, fertilizer and binder shall be thoroughly mixed with water in a hydroseeding tank capable of continually agitating the mixture during the hydroseeding operation to ensure that a homogeneous slurry is produced.

.6 Application Rates

  .1 Application rates shall be as shown in Table 614-3 and may vary by ±15%, depending on ground conditions.

  .2 Binder is required with Hydroseeding A & AM, and with both the hydroseeding and mulching operations of Hydroseeding B and BM.

Table 614-3
Application Rates for Hydroseed

Type of Material	"A" (kg/ha)	"AM" (kg/ha)	"B" (kg/ha)	"BM" (kg/ha)	"C" (kg/ha)
Seed	125	200	125	200	125
Fertilizer	375	375	375	375	375
Hydraulic Mulch: All	1500	1500	500	500	N/A
Binder (tackifer)	See Note	See Note	See Note	See Note	N/A
Mulch:					
Hay/straw bales/rolls	N/A	N/A	Per 616.4	N/A	N/A
Processed straw	N/A	N/A	Per 616.4	Per 616.4	N/A
Bonded fibre matrix	N/A	N/A	N/A	N/A	4100
Note: Application rate per manufacturer's specifications.					

614.4.6 .3 Hydroseeding B includes mulching, using either the mulch of 616.2.2.1 applied after hydroseeding, or the mulch of 616.2.2.2 applied with the hydroseeding mix and/or afterwards.

614.4 .7 Hydroseeding C

.1 Hydroseeding C shall consist of a slurry of three ingredients: seed, fertilizer and bonded fibre matrix at the rates shown in Table 614-3. Application rates for this mix shall not vary by more than 5%.

.2 Hydroseeding C shall be tested for consistency in the presence of the Engineer before any Work is begun, by depositing a 250 mL sample of slurry on a flat surface. The slurry will be acceptable for use if free water does not flow more than 25 mm out from the sample within one minute.

.3 Hydroseeding C shall be applied onto pre-measured areas of the slopes, in successive layers from opposite directions until the prescribed rate is in place. To ensure complete and uniform coverage of the ground, spraying from both top and bottom of the slope may be necessary.

.1 Only contractors who have been certified by the manufacturer of the bonded fibre matrix will be permitted to apply the product.

.4 The applied mix shall form a continuous blanket providing 100% coverage of the ground and in full contact with the ground. The mix, after drying, shall not dissolve or disperse upon rewetting, and shall not form a crust which inhibits water infiltration.

614.4 .8 Timing of Application

.1 Hydroseeding shall be carried out in all cases within 2 Days after completion of the surface preparation, as defined by 614.4.4.

  .1 The Engineer shall approve and pre-measure all areas to be hydroseeded, in advance of the commencement of the hydroseeding of any area.

  .2 The Engineer shall be notified at least 24 hours in advance of the application of the hydroseeding.

.2 Hydroseeding should not be performed during windy conditions or periods of rainfall.

  .1 Hydroseeding C shall not be applied under the following conditions:

    .1 During or immediately after a heavy rainfall;

    .2 If rain is forecast to occur within the next 24 hours, or within the next 48 hours if the Engineer deems that drying conditions are poor; and

    .3 On slopes that are leaching water.

.3 Hydroseeding done between May 1st and Labour Day must produce a satisfactory growth over at least 95% of the area hydroseeded in the growing season of that year.

  .1 Areas of poor or no growth which exceed five percent (measured cumulatively) of the area hydroseeded shall be reseeded.

  .2 Either Hydroseeding A (AM) or B (BM) at the discretion of the Engineer, may be used for the period of May 1st to Labour Day.

.4 After Labour Day, and up to the end of the week in which September 30th occurs, only Hydroseeding B (BM) shall be used, incorporating a 10-20-20 fertilizer mix as per 614.2.3.

  .1 The hay/straw mulching operation, which forms part of Hydroseeding B (BM), shall be carried out within 48 hours of the hydroseeding operation in accordance with 616.4.

  .2 Growth will be based on the performance during the next growing season as per the conditions of 614.4.8.3.

.5 No hydroseeding shall be carried out after the week of September 30th without the prior approval of the Engineer.

.6 The Contractor shall take all reasonable care to prevent overspray onto Structures, signs, and all other installations and, where such overspray occurs, the Contractor shall remove it by a method approved by the Engineer.

  .1 Where overspray comes in contact with the foliage of any trees, shrubs or other susceptible vegetation, the Contractor shall immediately spray the affected vegetation with water to remove such overspray.

614.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the area in square metres of hydroseeding supplied and applied in accordance with this Item.

.2 The area shall be measured along the slope of the ground.

614.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall include a separate Unit Price for each type of hydroseeding, as identified under the Contract.

615.1 DESCRIPTION

.1 This Item consists of supplying and applying fertilizer.

615.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Fertilizer shall have a composition of 20-10-10 (N-P-K) with 50% of the nitrogen being derived from sulphur-coated urea.

.3 Hydraulic mulch shall be shredded wood fibres or shredded newsprint coloured green with an environmentally acceptable dye.

  .1 Hydraulic mulch shall contain no growth-inhibiting chemicals or compounds.

  .2 Hydraulic mulch material shall form a homogeneous slurry when agitated or mixed in water with the other specified materials.

.4 Water shall be free of any impurities which would inhibit the effect of the fertilizer.

615.3 SUBMITTALS

.1 The Contractor shall submit, upon request, the manufacturer's and/or supplier's certification that the materials supplied meet the specified requirements as detailed in the Contract Documents.

.2 The Contractor shall submit the proposed proportioning of the ingredients and coverage per tankful for the selected Equipment to be employed in the Work and in conjunction with 615.3.1.

615.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Application shall be by hydroseeding methods and no direct access to the areas with Equipment will be permitted.

.3 Fertilizing shall be carried out between mid-April and Victoria Day.

  .1 The Engineer shall be notified at least 24 hours in advance of the application of the fertilizer.

.4 The Contractor shall not perform the Work under adverse field conditions.

615.4 .5 Hydraulic mulch, at the rate of 150 kg/ha, shall be mixed with water in the fertilizer tank.

.6 Fertilizer, at the rate of 250 kg/ha, shall be introduced immediately prior to spraying, with agitation sufficient to distribute the mix uniformly in the tank.

.7 Application rates shall not vary by more than 15%.

.8 The Contractor shall take all reasonable care to prevent overspray onto Structures, signs, and all other installations and, where such overspray occurs, the Contractor shall remove it by a method approved by the Engineer.

  .1 Where overspray comes in contact with the foliage of any trees, shrubs or other susceptible vegetation, the Contractor shall immediately spray the affected vegetation with water to remove such overspray.

615.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the area in square metres of fertilizer supplied and applied in accordance with this Item.

.2 Areas shall be measured along the slope of the ground.

615.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

616.1 DESCRIPTION

.1 This Item consists of the supply and application of mulch on exposed ground.

616.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Mulch shall be hay or straw and supplied in either of the following forms:

  .1 Unprocessed form such as bales or rolls, free of noxious weeds and other undesirable material, and not so wet, decayed or compacted so as to inhibit even and uniform spreading, or

  .2 Processed form being a shredded straw, newsprint and/or raw cotton fibres mixture and packaged in plastic bags, or

  .3 Approved equivalent.

.3 When applied the mulch shall form an absorptive mat, which will allow moisture to percolate into the underlying soil.

.4 Binder must be capable of joining together the mulch particles to secure the mulch to the ground and shall remain effective for 60 Days from the time of application.

.5 Binder shall not form an impervious seal which would prevent the penetration of moisture to the underlying soil.

.6 Binder may be supplied in liquid, flake or powder form.

.7 Water shall be contaminant-free and obtained from a source approved by the appropriate regulatory agency.

616.3 SUBMITTALS

.1 The Contractor shall submit, upon request, the manufacturer's and/or supplier's certification that the materials supplied meet the specified requirements as detailed in the Contract Documents.

616.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

  .1 The Engineer shall be notified at least 24 hours in advance of the Work.

616.4 .2 Mulch shall be applied with binder at the manufacturer's recommended application rate.

.3 Approved unprocessed hay or straw mulch shall be spread evenly and uniformly at a rate of 4500 kg/ha ± 15%.

.1 Lumps and thick clumps of mulch shall be broken apart and dispersed.

.2 Binder shall be mixed in a solution of water with sufficient green dye or green-coloured wood-fibre or paper mulch and sprayed uniformly over the mulched ground.

.3 Binder application shall be completed within 48 hours after the unprocessed hay or straw has been placed.

.4 Approved processed mulch shall be mixed with water and binder and sprayed uniformly over the designated areas at a rate of 2400 kg/ha ± 15%.

.1 If the processed hay/straw mulch of 616.2.2.2 tends to clog the hydroseeding unit, the Contractor may mix paper or wood fibre mulch with it at a ratio not exceeding 1:2, for an application rate of 2700 kg/ha comprised of not more than 900 kg/ha of paper/wood fibre mulch and not less than 1800 kg/ha of processed hay/straw mulch.

.5 The Contractor shall maintain the mulched areas until mulch is no longer required during the Contract period.

.1 The Contractor shall apply additional mulch as required, to restore the area(s) exposed after the initial application of mulch.

.6 The Contractor shall take all reasonable care to prevent overspray onto Structures, signs, and all other installations and, where such overspray occurs, the Contractor shall remove it by a method approved by the Engineer.

.7 Areas requiring the hand placement of mulch may, subject to the approval of the Engineer, be placed without binder.

616.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment shall be the area in square metres of mulch supplied and applied in accordance with this Item.

.2 Areas shall be measured along the slope of the ground.

616.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

618.1 DESCRIPTION

.1 This Item consists of the supply, planting and maintenance of trees and shrubs.

618.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Trees and shrubs shall be of the species indicated below or as indicated in the Contract Documents:

  .1 Trees shall be White Ash, Hybrid Poplar and/or Yellow Birch.

  .2 Shrubs shall be Speckled Alder and/or Red Osier Dogwood.

.3 Trees and shrubs shall be free of disease, insects, defects or injuries and shall be structurally sound with a strong fibrous root system.

.4 Plants, if supplied from the vicinity of the Work Site, shall have adequate root systems, in excess of 750 mm for trees and 450 mm for shrubs.

.5 Nursery stock shall have a root ball at least 200 mm in diameter including the roots and surrounding soil.

.6 Topsoil shall meet the requirements of 613.2.

.7 Stakes for supporting trees shall be steel T-bar, 32 x 32 x 5 mm, or wood, 38 x 38 mm, each a minimum of 2130 mm long.

.8 Trees shall be tied to stakes using trunk collars which neither pinch nor are abrasive to the tree trunks.

618.3 SUBMITTALS

.1 The Contractor shall notify the Engineer, in writing, for approval of the source of supply of material, at least 14 days in advance of obtaining material from the source proposed.

618.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 Roots of the trees and shrubs shall be kept moist until planting by the use of wet burlap bags or other approved means.

.3 Excavation for planting shall be to a depth of 150 mm below and around the root system or root ball.

618.4 .4 Each tree and shrub shall be placed on a bedding of topsoil of 150 mm loose thickness, and topsoil shall be placed around the root system in 150 mm lifts, tamped to eliminate voids.

.5 When two-thirds backfilled, the planting hole shall be filled with water. After the water has penetrated into soil, the remaining depth of hole shall be backfilled to finish grade.

.6 A berm shall be built around the rim of the hole and the plant watered again.

.7 Trees large enough to require staking shall be staked and tied at the time of planting, as approved by the Engineer.

.8 The Contractor shall shall be responsible to water each plant daily for at least two weeks after planting and as necessary thereafter, so as to maintain soil moisture conditions required for plant growth without causing erosion of the surrounding berm.

.9 The Contractor shall guarantee the trees and shrubs for both the year of planting and the following growing season, and shall replace at his cost all trees and shrubs not sustaining growth within the warranty period, except those damaged by vandalism or flooding or other natural distasters.

618.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment will be the number of trees and shrubs supplied, planted and maintained in accordance with this Item.

618.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

.2 Holdback in the amount of 20% of the value of the Work under this Item will be held until the expiration of the warranty period or until released by the Engineer, whichever is the least time.

620.1 DESCRIPTION

.1 This Item consists of the supply, installation, maintenance and removal of a temporary water barrier.

620.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

.2 Plastic liners shall be clear polyethylene a minimum of 6 mils thick, and shall meet the requirements of CGSB 51.34.

620.3 SUBMITTALS

.1 The Contractor shall submit for approval, at least 14 days prior to starting Work under this Item, plans and details of the proposed temporary water barrier.

620.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work in accordance with Item 948.

.3 The Contractor shall maintain the temporary water barrier in a functional condition continuously throughout the period of use.

.4 The Contractor shall inspect the temporary water barrier after each rainfall and at least daily periods of prolonged rainfall.

.5 The Contractor shall immediately repair and damage to the temporary water barrier or parts thereof.

.6 When the temporary barrier is no longer required, the Contractor shall remove from the watercourse all materials pertaining to the temporary water barrier.

  .1 Temporary water barrier located within the limits of an embankment to be constructed may be left in place and incorporated into the final embankment as approved by the Engineer.

620.5 MEASUREMENT FOR PAYMENT

.1 The Quantity to be measured for payment will be the number of linear metres of temporary water barrier supplied, installed, maintained and removed in accordance with this Item.

620.6 BASIS OF PAYMENT

.1 Payment for Work under this Item shall be at the Unit Price.

621.1 DESCRIPTION

.1 This Item consists of the design, supply, placement and removal of temporary water control works.

621.2 MATERIALS

.1 All materials shall be supplied by the Contractor.

621.3 SUBMITTALS

.1 The Contractor shall submit the design for approval by the Engineer at least 14 Days in advance of the Work.

621.4 CONSTRUCTION

.1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Engineer.

.2 The Contractor shall carry out the Work in accordance with Item 948.

.3 The temporary water control works shall separate the Work Area from the flow of the watercourse, and keep the Work Area dry.

.4 If required, temporary water control works shall facilitate fish passage through the Work Site in both the upstream and downstream direction.

.5 The Contractor shall maintain the temporary water control works in a functional condition continuously throughout the period of use.

.6 The Contractor shall inspect the temporary water control works after each rainfall and at least daily during periods of prolonged rainfall.

.7 The Contractor shall immediately repair any damage to the temporary water control works or parts thereof.

.8 When temporary water control works is no longer required, the Contractor shall remove from the watercourse all materials pertaining to the temporary water control works.

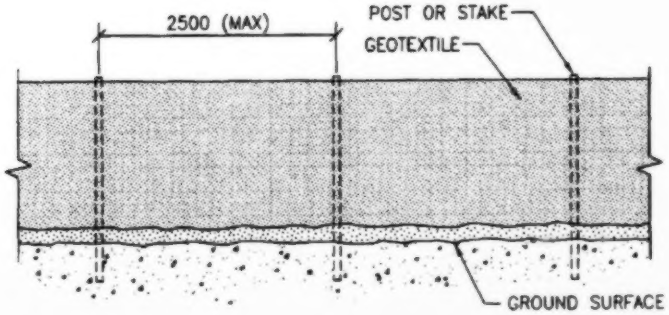
  .1 Temporary water control works located within the limits of an embankment to be constructed may be left in place and incorporated into the final embankment as approved by the Engineer.

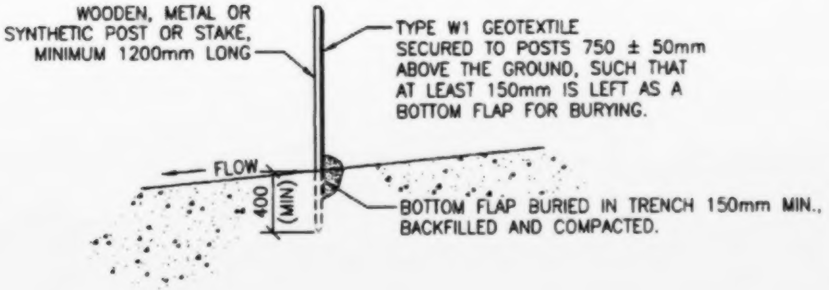
621.5 MEASUREMENT FOR PAYMENT

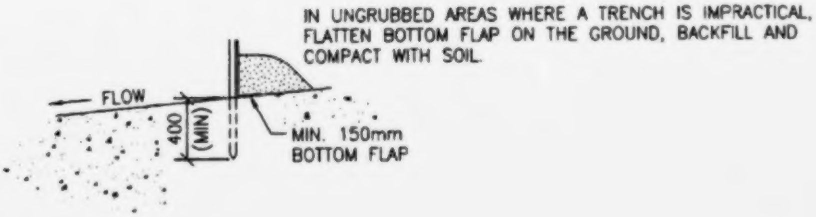
.1 The design, supply, and all Work related to providing temporary water control works in accordance with this Item shall be paid for on a Lump Sum basis.

621.6 BASIS OF PAYMENT

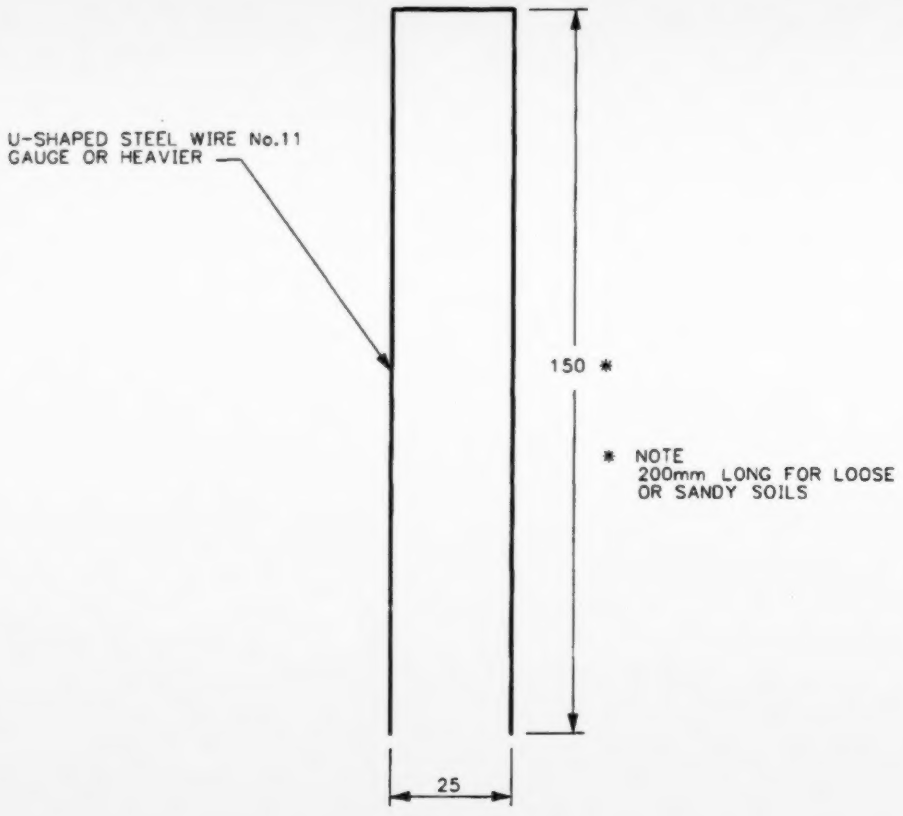
.1 Payment for Work under this Item shall be at the Unit Price.


2500 (MAX)
POST OR STAKE
GEOTEXTILE
GROUND SURFACE

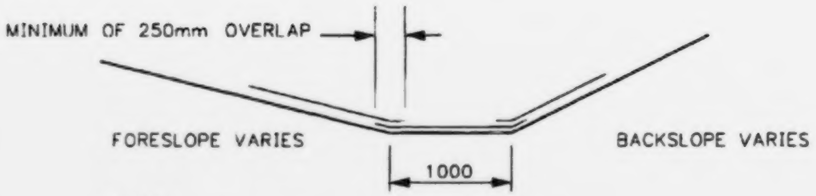

WOODEN, METAL OR
SYNTHETIC POST OR STAKE,
MINIMUM 1200mm LONG
TYPE W1 GEOTEXTILE
SECURED TO POSTS 750 ± 50mm
ABOVE THE GROUND, SUCH THAT
AT LEAST 150mm IS LEFT AS A
BOTTOM FLAP FOR BURYING.
FLOW
400
(MIN)
BOTTOM FLAP BURIED IN TRENCH 150mm MIN.,
BACKFILLED AND COMPACTED.


IN UNGRUBBED AREAS WHERE A TRENCH IS IMPRACTICAL,
FLATTEN BOTTOM FLAP ON THE GROUND, BACKFILL AND
COMPACT WITH SOIL.
FLOW
400
(MIN)
MIN. 150mm
BOTTOM FLAP

Sediment Control Fence


U-SHAPED STEEL WIRE No.11 GAUGE OR HEAVIER
150 *
25
* NOTE
200mm LONG FOR LOOSE OR SANDY SOILS

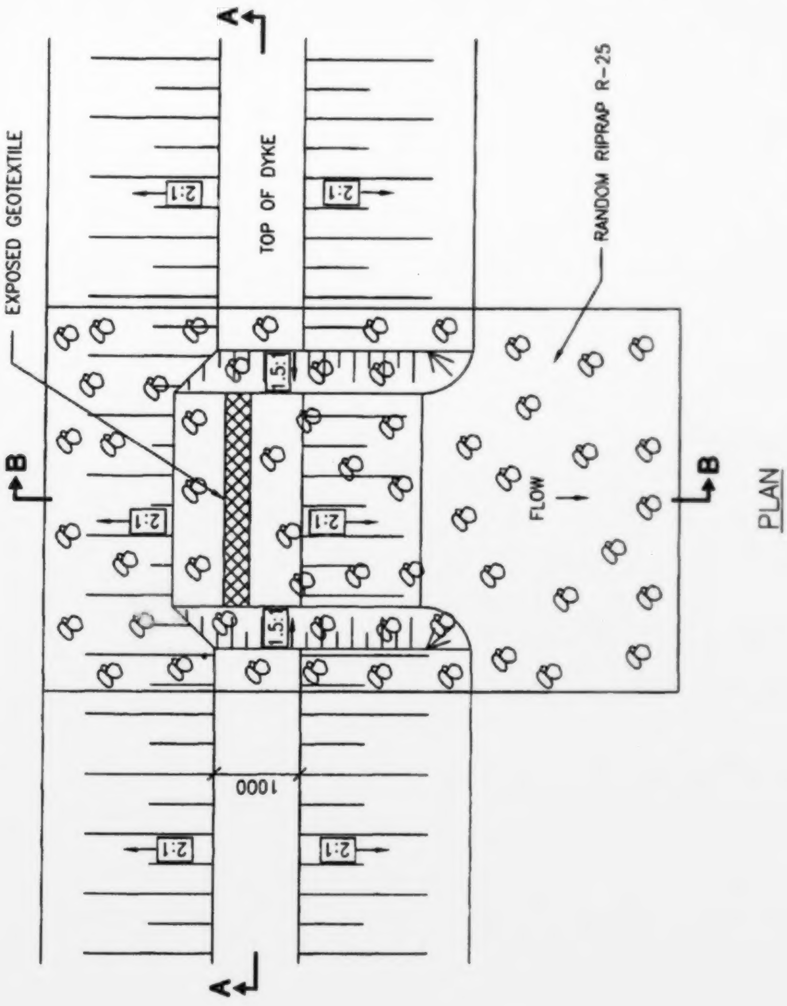
STAPLE DETAIL


MINIMUM OF 250mm OVERLAP
FORESLOPE VARIES
BACKSLOPE VARIES
1000

NOTES
1. ALWAYS USE THREE STRIPS OF JUTE MATS
2. JUTE MATS ARE TO BE INSTALLED LONGITUDINALLY IN THE DITCH
3. LAY FIRST STRIP IN DITCH BOTTOM

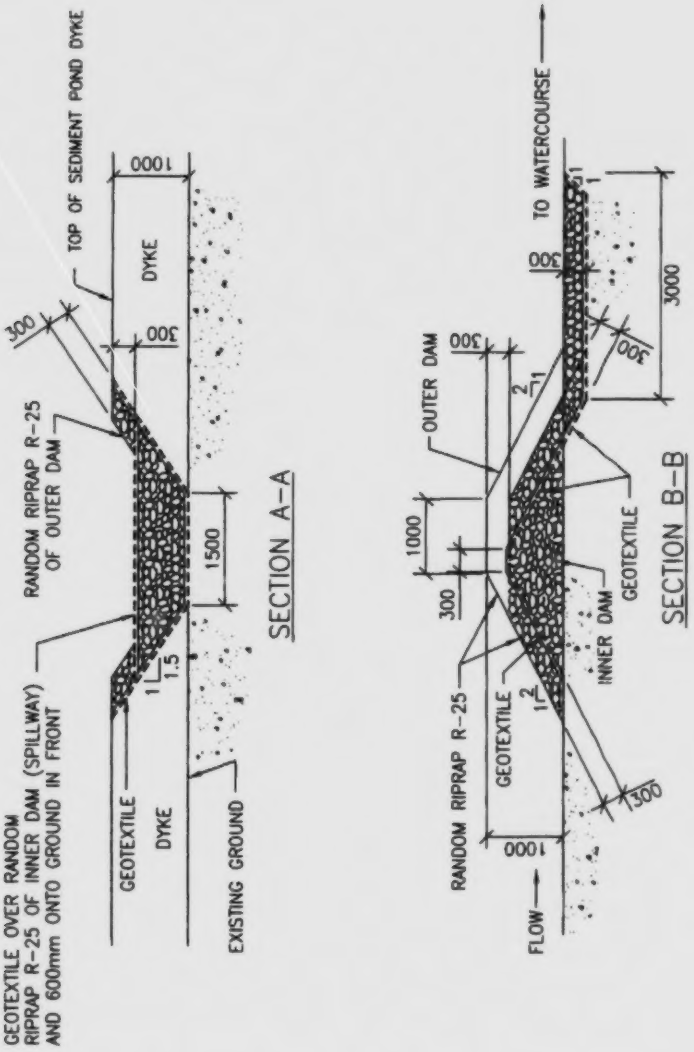
Jute Mat Details

File: 604-1


A
A
B
B
TOP OF DYKE
EXPOSED GEOTEXTILE
RANDOM RIPRAP R-25
2:1
2:1
2:1
2:1
2:1
2:1
1.5:1
1.5:1
FLOW
1000
PLAN

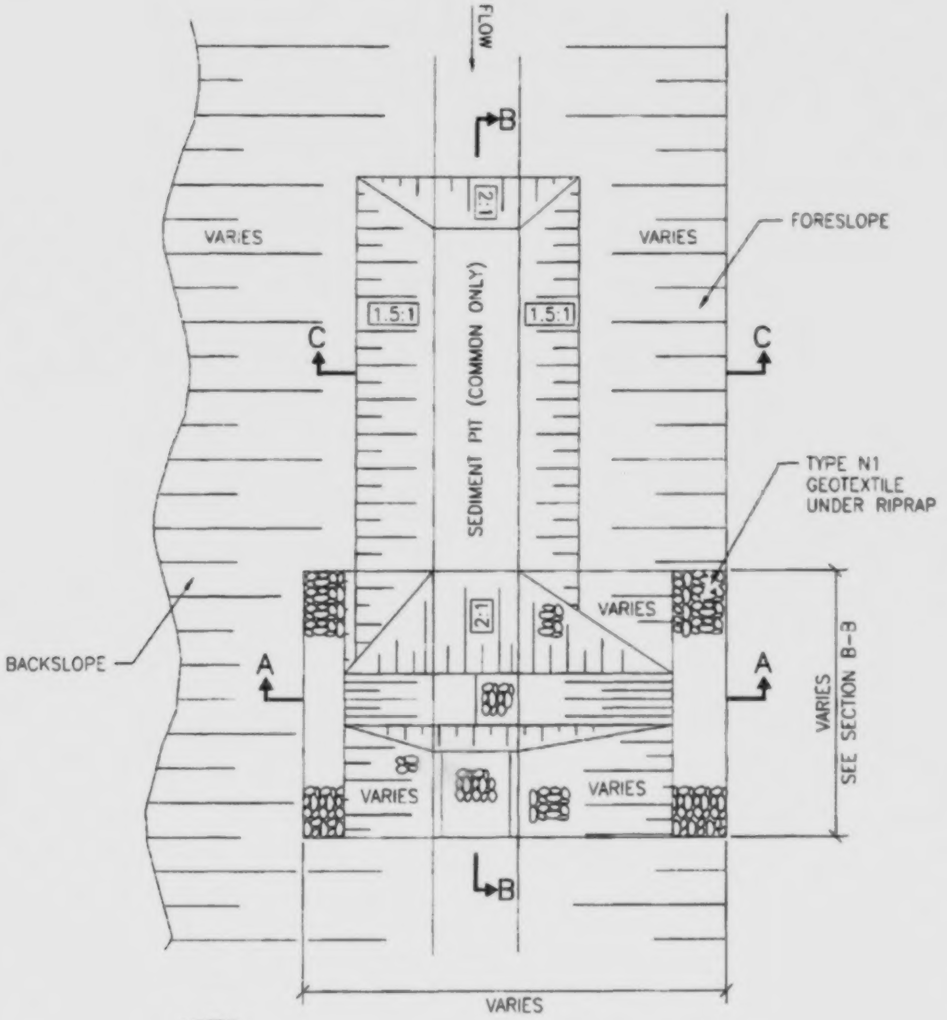
SECTION DETAILS ON STANDARD DRAWING 605-2

Type A - Spillway Structure for Sediment Pond


GEOTEXTILE OVER RANDOM RIPRAP R-25 OF INNER DAM (SPILLWAY) AND 600mm ONTO GROUND IN FRONT
GEOTEXTILE
DYKE
EXISTING GROUND
1
1.5
1500
RANDOM RIPRAP R-25 OF OUTER DAM
300
300
DYKE
TOP OF SEDIMENT POND DYKE
1000
SECTION A–A
FLOW
1000
RANDOM RIPRAP R-25
GEOTEXTILE
1
2
300
300
1000
INNER DAM
GEOTEXTILE
OUTER DAM
300
2
1
300
3000
300
1.5
1
TO WATERCOURSE
SECTION B–B

PLAN / SECTION LINES ON STANDARD DRAWING 605-1

Type A - Spillway Structure Details


FLOW
B
2:1
VARIES
VARIES
FORESLOPE
1.5:1
SEDIMENT PIT (COMMON ONLY)
1.5:1
C
C
TYPE N1
GEOTEXTILE
UNDER RIPRAP
2:1
VARIES
BACKSLOPE
A
A
VARIES
SEE SECTION B-B
VARIES
VARIES
B
VARIES

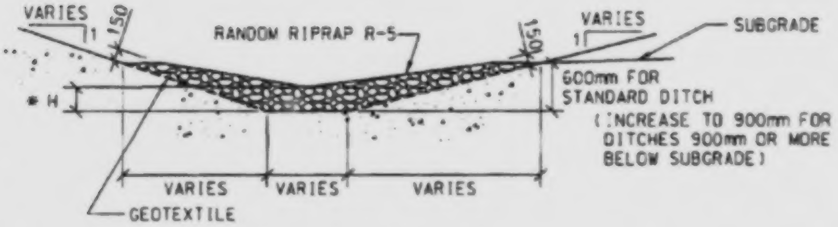
NOTES:

1. DEPTH, WIDTH AND SIDE SLOPES OF SEDIMENT PIT MAY VARY WITH SOIL CONDITIONS AS DIRECTED BY THE ENGINEER
2. ALL RIPRAP SHOWN IS R-5 SIZE

SECTION DETAILS ON STANDARD DRAWING 605-4

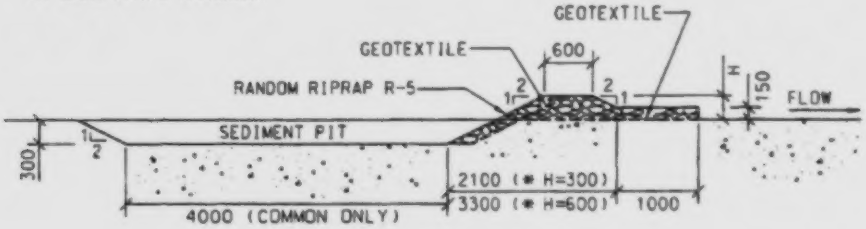
File: 605-3

Type B - Erosion Control Structure for Ditches

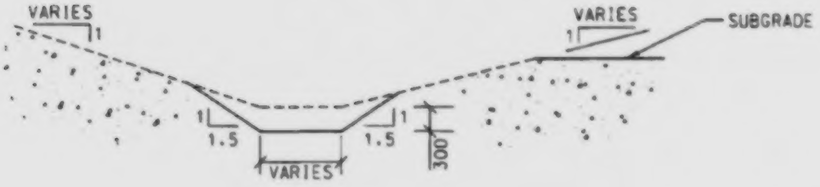

VARIES
1
150
RANDOM RIPRAP R-5
150
VARIES
1
SUBGRADE
600mm FOR STANDARD DITCH (INCREASE TO 900mm FOR DITCHES 900mm OR MORE BELOW SUBGRADE)
* H
VARIES
VARIES
VARIES
GEOTEXTILE

SECTION A-A

* H = 300mm FOR STANDARD
DITCH DEPTH OF 600mm
OR
600mm FOR DITCHES 900mm
OR MORE BELOW SUBGRADE


GEOTEXTILE
GEOTEXTILE
600
RANDOM RIPRAP R-5
1
2
2
1
H
150
FLOW
SEDIMENT PIT
1
2
300
2100 (* H=300)
3300 (* H=600)
1000
4000 (COMMON ONLY)

SECTION B-B

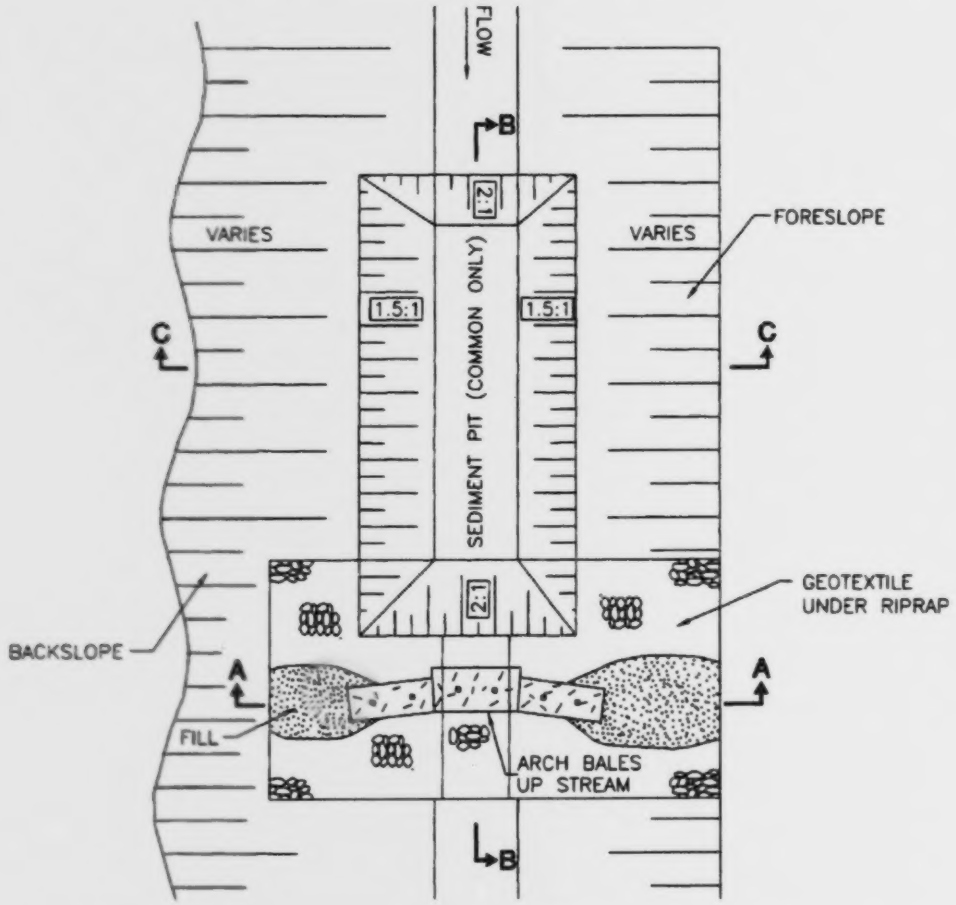

VARIES
1
VARIES
1
SUBGRADE
1
1.5
1
1.5
300
VARIES

SECTION C-C
(COMMON ONLY)

PLAN/SECTION LINES ON STANDARD DRAWING 605-3

File: 605-4

Type B - Erosion Control Structure Details

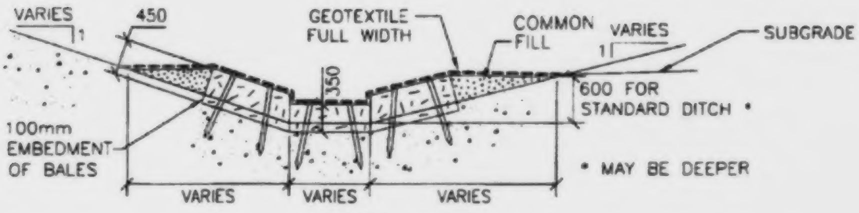

FLOW
B
B
2:1
SEDIMENT PIT (COMMON ONLY)
1.5:1
1.5:1
2:1
VARIES
VARIES
FORESLOPE
C
C
GEOTEXTILE
UNDER RIPRAP
BACKSLOPE
A
A
FILL
ARCH BALES
UP STREAM

NOTES:

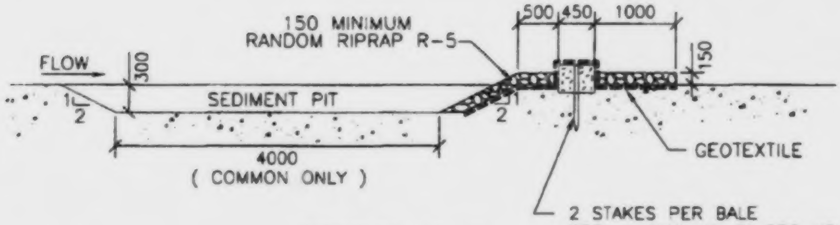
1. NUMBER OF HAY/STRAW BALES REQUIRED VARIES DEPENDING ON BACKSLOPE AND FORESLOPE, AND DITCH WIDTH AND DEPTH.
2. DEPTH, WIDTH AND SIDE SLOPES OF SEDIMENT PIT MAY VARY WITH SOIL CONDITIONS AS DIRECTED BY THE ENGINEER.
3. THE GEOTEXTILE MUST BE PLACED OVER THE BALES AND DYKES AND EXTEND ALONG THE GROUND IN FRONT AND BACK OF THIS DAM, AND BE HELD IN PLACE BY THE RIPRAP R-5.

SECTION DETAILS ON STANDARD DRAWING 605-6

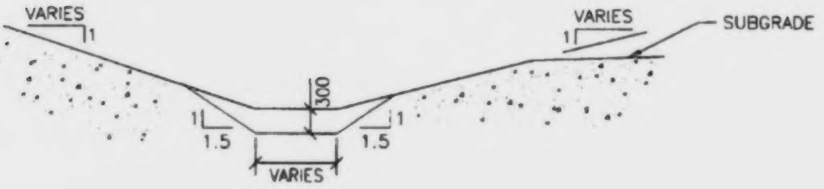
Type C - Erosion Control Structure for Ditches


VARIES
1
450
GEOTEXTILE FULL WIDTH
COMMON FILL
VARIES
1
SUBGRADE
350
600 FOR STANDARD DITCH *
100mm EMBEDMENT OF BALES
* MAY BE DEEPER
VARIES
VARIES
VARIES

SECTION A-A


150 MINIMUM RANDOM RIPRAP R-5
500
450
1000
FLOW
300
150
1
2
SEDIMENT PIT
2
4000
(COMMON ONLY)
GEOTEXTILE
2 STAKES PER BALE 300mm MINIMUM IN GROUND

SECTION B-B

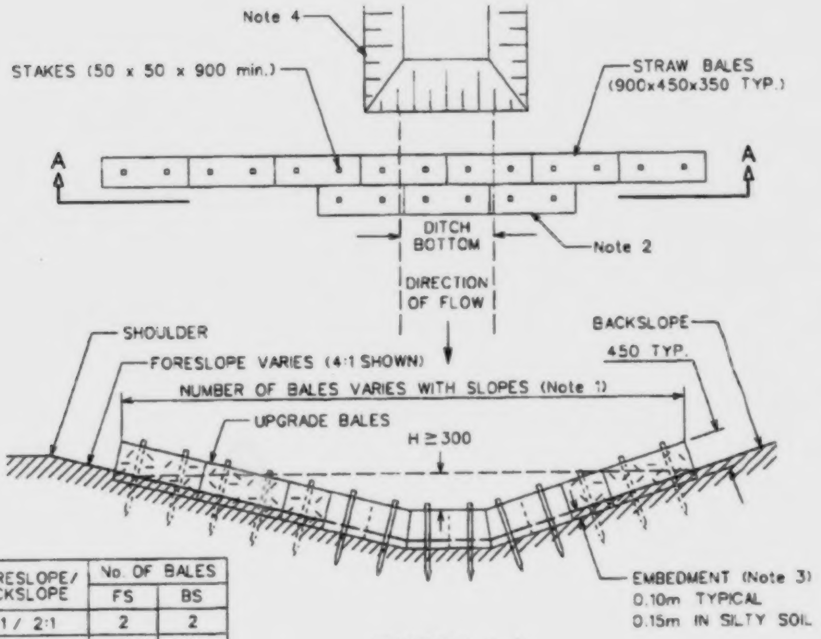

VARIES
1
VARIES
1
SUBGRADE
300
1
1.5
1
1.5
VARIES

SECTION C-C
(COMMON ONLY)

PLAN / SECTION LINES ON STANDARD DRAWING 605-5

File: 605-6

Type C - Erosion Control Structure Details


Note 4
STAKES (50 x 50 x 900 min.)
STRAW BALES (900x450x350 TYP.)
A
A
DITCH BOTTOM
Note 2
DIRECTION OF FLOW
SHOULDER
BACKSLOPE
FORESLOPE VARIES (4:1 SHOWN)
450 TYP.
NUMBER OF BALES VARIES WITH SLOPES (Note 1)
UPGRADE BALES
H ≥ 300
EMBEDMENT (Note 3)
0.10m TYPICAL
0.15m IN SILTY SOIL

SECTION A-A

FORESLOPE/ BACKSLOPE	No. OF BALES	
	FS	BS
2:1 / 2:1	2	2
3:1 / 2:1	3	2
3:1 / 3:1	3	3
4:1 / 3:1	4	3
6:1 / 3:1	5	3
WIDE SWALES	AS REQ'D	

NOTES:

1) SEE TABLE FOR TYPICAL NUMBER OF UPSTREAM BALES WHICH ARE REQUIRED TO ENSURE MIN. 300mm FOR HEIGHT 'H' (FROM TOP OF BALES AT DITCH CENTRE TO POINT WHERE HIGHEST BALES INTERCEPT SLOPES.)

2) INSTALL MINIMUM OF 3 BALES DOWNGRADE AS REINFORCEMENT. JOINTS OF DOWNGRADE BALES SHOULD BE STAGGERED FROM UPSTREAM BALES.

3) IF TRENCH FOR BALE EMBEDMENT IS EXCAVATED WIDER THAN BALES, BACKFILL WITH EXCAVATED MATERIAL.

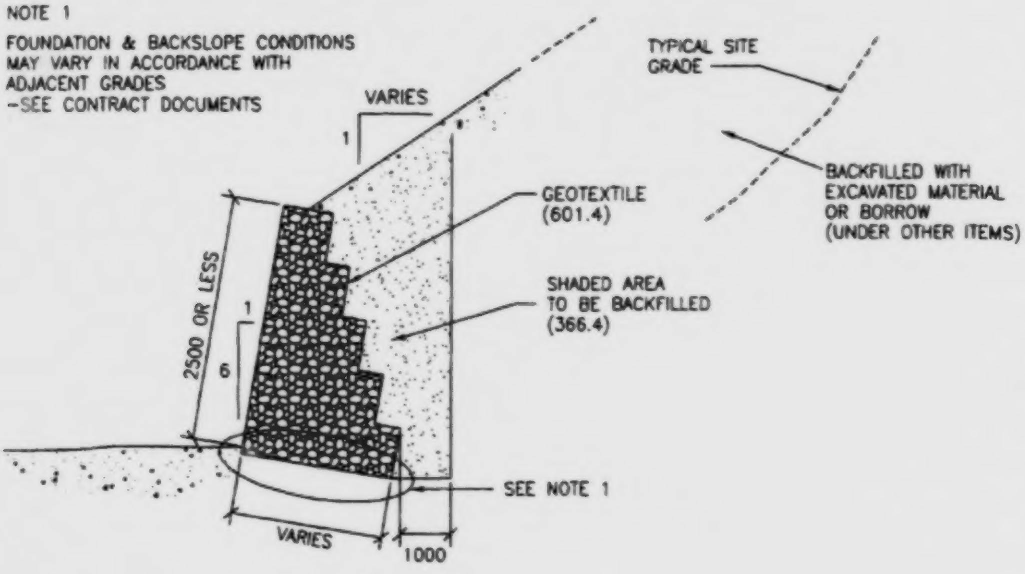
4) THE SEDIMENT PIT OF STANDARD DWGS 605-5 AND 605-6 IS REQUIRED FOR TYPE 'D' STRUCTURE.

Type D - Erosion Control Structure for Ditches

File: 605-7

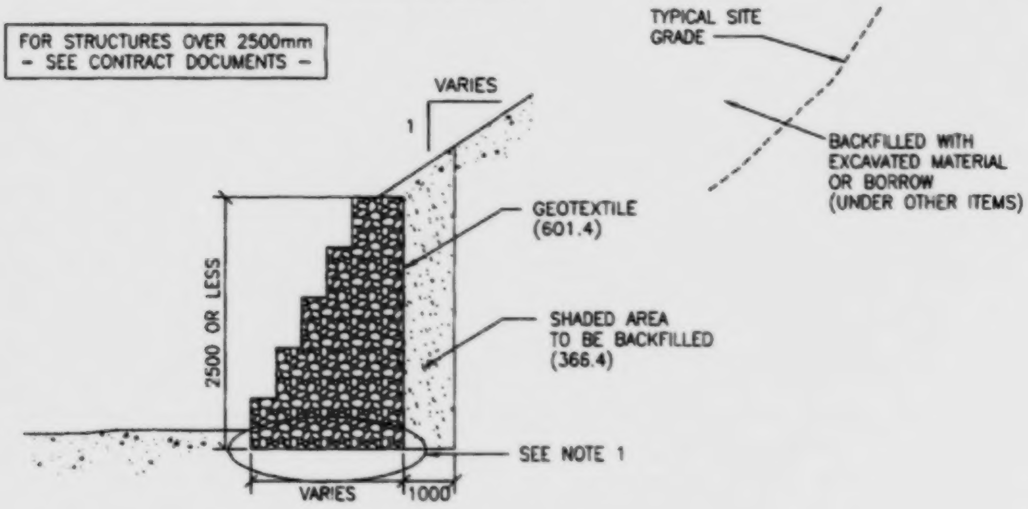
NOTE 1

FOUNDATION & BACKSLOPE CONDITIONS MAY VARY IN ACCORDANCE WITH ADJACENT GRADES
-SEE CONTRACT DOCUMENTS


VARIES
1
TYPICAL SITE GRADE
BACKFILLED WITH EXCAVATED MATERIAL OR BORROW (UNDER OTHER ITEMS)
GEOTEXTILE (601.4)
2500 OR LESS
1
6
SHADED AREA TO BE BACKFILLED (366.4)
SEE NOTE 1
VARIES
1000

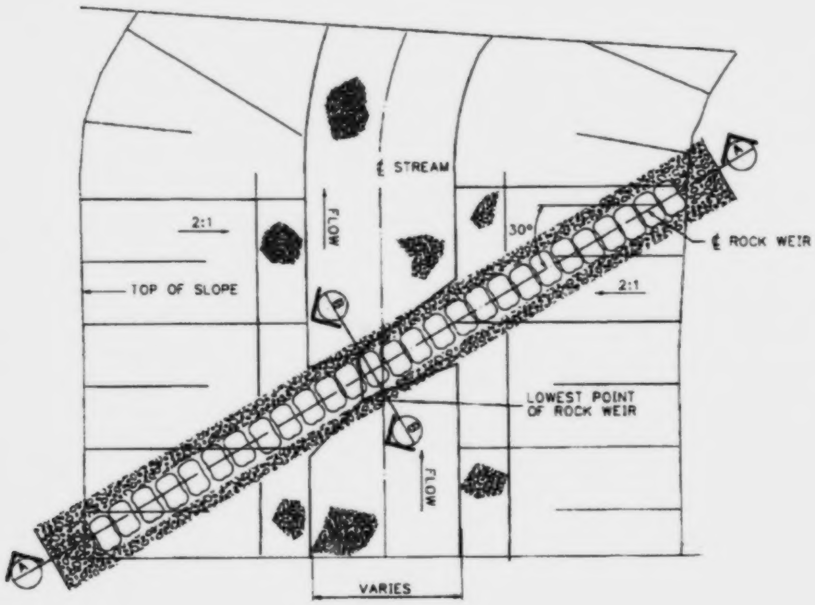
SLOPING FRONT

FOR STRUCTURES OVER 2500mm
- SEE CONTRACT DOCUMENTS -


TYPICAL SITE GRADE
VARIES
1
BACKFILLED WITH EXCAVATED MATERIAL OR BORROW (UNDER OTHER ITEMS)
GEOTEXTILE (601.4)
2500 OR LESS
SHADED AREA TO BE BACKFILLED (366.4)
SEE NOTE 1
VARIES
1000

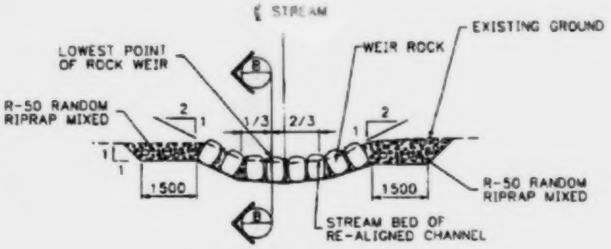
STEPPED FRONT

Gabion Backfilling Details


℄ STREAM
FLOW
2:1
TOP OF SLOPE
30°
℄ ROCK WEIR
2:1
LOWEST POINT
OF ROCK WEIR
FLOW
A
A
B
B
VARIES

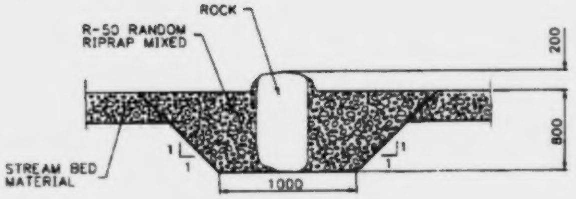
PLAN

N.T.S.


℄ STREAM
LOWEST POINT
OF ROCK WEIR
WEIR ROCK
EXISTING GROUND
R-50 RANDOM
RIPRAP MIXED
2
1
1/3
2/3
2
1
1
1
1500
1500
R-50 RANDOM
RIPRAP MIXED
STREAM BED OF
RE-ALIGNED CHANNEL
B
B

SECTION A-A

N.T.S.

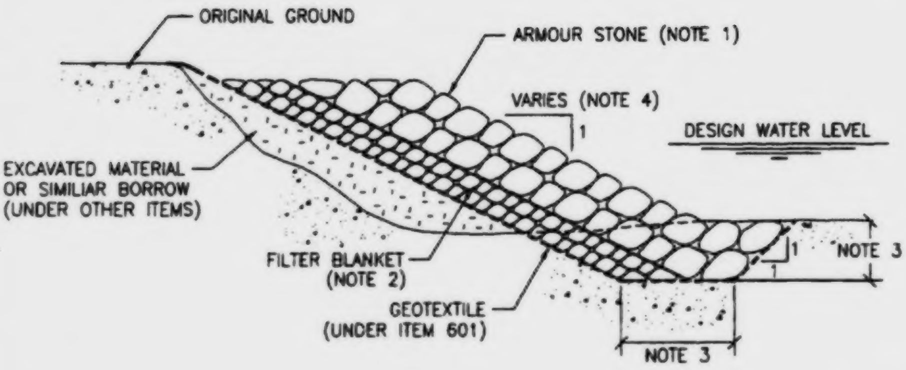

ROCK
R-50 RANDOM
RIPRAP MIXED
200
800
1
1
1
1
STREAM BED
MATERIAL
1000

SECTION B-B

N.T.S.

Rock Weir Details

File: 609-1


ORIGINAL GROUND
ARMOUR STONE (NOTE 1)
VARIES (NOTE 4)
1
DESIGN WATER LEVEL
EXCAVATED MATERIAL
OR SIMILIAR BORROW
(UNDER OTHER ITEMS)
1
NOTE 3
1
FILTER BLANKET
(NOTE 2)
GEOTEXTILE
(UNDER ITEM 601)
NOTE 3

NOTES:

1. ARMOUR STONE – SIZE AND THICKNESS AS SPECIFIED IN THE CONTRACT DOCUMENTS. APPROXIMATELY 2 ROCKS THICK.
2. FILTER BLANKET – SIZE AND THICKNESS AS SPECIFIED IN THE CONTRACT DOCUMENTS. APPROXIMATELY 2 ROCKS THICK.
3. TOE DEPTH AS SPECIFIED IN THE CONTRACT DOCUMENTS.
4. SLOPE AS SPECIFIED IN THE CONTRACT DOCUMENTS.

Armour Stone Protection System Details

FILE: 610-1

DIVISION 700

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DIVISION 800

ITEM	DESCRIPTION	NUMBER OF PAGES
801	Haulage -Soil, Rock and Aggregate	2
802	Haulage - Asphalt Concrete	1
806	Overhaul - Common Excavation	1
807	Overhaul - Unclassified Excavation	1
808	Overhaul - Solid Rock Excavation	1
810	Fixed Rates	1
811	Force Account	1
812	Extra Work	7
820	Payment Adjustments	1

801.1 DESCRIPTION

.1 Haulage rates for the haulage of specified soil, rock and aggregate materials shall be as identified in Table 801-1 on a tonne-kilometre basis.

801.2 APPLICATION

.1 The provision for payment of haulage on any Item shall be specifically and clearly stated in the Item or in the Contract Documents.

  .1 If no specific reference to the provision of payment is made under the Item or in the Contract Documents then the haulage shall be included in the Unit Price for the Item.

.2 Where the Contractor is required to include haulage of materials in the Unit Price, no separate payment for haulage and no mark-up on haulage shall be made by the Owner to the Contractor.

.3 Where the Owner provides for payment of the haulage of materials in the Item, the Owner shall pay the Contractor the haulage rates as set out in Table 801-1, plus a 5% mark-up.

  .1 If the Owner revises the haulage rates during the term of the Contract, the Owner shall pay the Contractor the revised rates plus the 5% mark-up from the date of the revision.

.4 Extra haulage to and from the weigh scale location shall not be paid when the weigh scale is not along the most direct route permissible by law between the material source and the location of placement of the material at the Work Site.

801.3 PRIVATE TRUCKS

.1 Notwithstanding 801.1 and 801.2, the Contractor shall pay to the owner of Private Trucks haulage rates not less than the haulage rates as set out in Table 801-1 herein for materials governed under Item 932.

.2 Revisions made to haulage rates by the Owner, during the term of the Contract, shall from the date of the revision result in the following:

  .1 An adjustment shall be made to cover the increase or decrease in rates and the Contractor shall pay the revised rates to the owners of Private Trucks.

  .2 A 5% markup will be applied only to the amount of the increase or decrease in rates.

Table 801-1
HAULAGE RATES
Soil, Rock and Aggregate

• effective April 1, 2006 •

DISTANCE in KILOMETRES	RATE per TONNE ($)	DISTANCE in KILOMETRES	RATE per TONNE ($)	DISTANCE in KILOMETRES	RATE per TONNE ($)
0 - 1	0.84	25 - 26	4.71	50 - 51	7.67
1 - 2	1.02	26 - 27	4.85	51 - 52	7.76
2 - 3	1.18	27 - 28	4.98	52 - 53	7.84
3 - 4	1.35	28 - 29	5.12	53 - 54	7.94
4 - 5	1.50	29 - 30	5.26	54 - 55	8.02
5 - 6	1.65	30 - 31	5.41	55 - 56	8.11
6 - 7	1.81	31 - 32	5.54	56 - 57	8.19
7 - 8	1.96	32 - 33	5.67	57 - 58	8.28
8 - 9	2.11	33 - 34	5.80	58 - 59	8.37
9 - 10	2.26	34 - 35	5.94	59 - 60	8.46
10 - 11	2.42	35 - 36	6.07	60 - 61	8.55
11 - 12	2.57	36 - 37	6.18	61 - 62	8.63
12 - 13	2.72	37 - 38	6.30	62 - 63	8.72
13 - 14	2.88	38 - 39	6.43	63 - 64	8.80
14 - 15	3.03	39 - 40	6.55	64 - 65	8.89
15 - 16	3.18	40 - 41	6.65	65 - 66	8.97
16 - 17	3.34	41 - 42	6.76	66 - 67	9.05
17 - 18	3.49	42 - 43	6.89	67 - 68	9.12
18 - 19	3.64	43 - 44	6.98	68 - 69	9.20
19 - 20	3.79	44 - 45	7.09	69 - 70	9.27
20 - 21	3.95	45 - 46	7.19	70 - 71	9.35
21 - 22	4.10	46 - 47	7.28	71 - 72	9.42
22 - 23	4.25	47 - 48	7.38	72 - 73	9.51
23 - 24	4.41	48 - 49	7.49	73 - 74	9.58
24 - 25	4.56	49 - 50	7.58	74 - 75	9.66
Each succeeding kilometre after 75 kilometres increases at a rate of $ 0.07 per tonne					

802.1 DESCRIPTION

.1 Haulage rates in Tables 802-1 are applicable, for the haulage of asphalt concrete, on a tonne-kilometre basis.

.2 Revisions made to haulage rates by the Owner, during the term of the Contract, shall from the date of the revision result in the following:

- .1 An adjustment shall be made to cover the increase or decrease in rates and the Contractor shall pay the revised rates to the owners of Private Trucks.
- .2 A 5% markup will be applied only to the amount of the increase or decrease in rates.

Table 802-1
HAULAGE RATES
Hot Mix Asphalt Concrete

• effective April 1, 2006 •

DISTANCE in KILOMETRES	RATE per TONNE ($)	DISTANCE in KILOMETRES	RATE per TONNE ($)	DISTANCE in KILOMETRES	RATE per TONNE ($)
0 - 1	1.11	25 - 26	5.11	50 - 51	8.24
1 - 2	1.26	26 - 27	5.26	51 - 52	8.33
2 - 3	1.44	27 - 28	5.43	52 - 53	8.44
3 - 4	1.62	28 - 29	5.58	53 - 54	8.54
4 - 5	1.79	29 - 30	5.73	54 - 55	8.63
5 - 6	1.95	30 - 31	5.88	55 - 56	8.73
6 - 7	2.10	31 - 32	6.02	56 - 57	8.83
7 - 8	2.26	32 - 33	6.16	57 - 58	8.91
8 - 9	2.42	33 - 34	6.29	58 - 59	9.01
9 - 10	2.58	34 - 35	6.43	59 - 60	9.09
10 - 11	2.73	35 - 36	6.56	60 - 61	9.18
11 - 12	2.90	36 - 37	6.68	61 - 62	9.26
12 - 13	3.05	37 - 38	6.79	62 - 63	9.35
13 - 14	3.21	38 - 39	6.92	63 - 64	9.45
14 - 15	3.37	39 - 40	7.04	64 - 65	9.53
15 - 16	3.53	40 - 41	7.16	65 - 66	9.62
16 - 17	3.68	41 - 42	7.26	66 - 67	9.70
17 - 18	3.85	42 - 43	7.37	67 - 68	9.79
18 - 19	4.00	43 - 44	7.49	68 - 69	9.87
19 - 20	4.16	44 - 45	7.59	69 - 70	9.96
20 - 21	4.31	45 - 46	7.70	70 - 71	10.03
21 - 22	4.48	46 - 47	7.81	71 - 72	10.11
22 - 23	4.63	47 - 48	7.93	72 - 73	10.18
23 - 24	4.79	48 - 49	8.03	73 - 74	10.26
24 - 25	4.95	49 - 50	8.14	74 - 75	10.33
Each succeeding kilometre after 75 Kilometres increases at a rate of $ 0.07 per tonne					

806.1 DESCRIPTION

.1 Overhaul rates, when required under an Item, shall be paid to the Contractor by the Owner as set out in Table 806-1 herein.

.2 The overhaul rates are paid for the volume in cubic metres of excavated material measured in its original position; i.e., bank measure, and hauled more than 300 metres.

.3 If the overhaul rates are revised by the Owner during the term of the Contract, the Owner shall pay the Contractor the revised overhaul rates from the date of the revision.

Table 806-1
OVERHAUL RATES
Common Excavation

• effective April 1, 2006 •

Haul Distance	Common Materials $ per cubic metre
0 - 300 metres	freehaul
300 - 600 metres	0.61
600 - 900 metres	0.89
900 - 1200 metres	1.16
1200 - 1500 metres	1.43
1500 m - 2 km	1.70
2 - 3 km	1.97
3 - 4 km	2.20
4 - 5 km	2.44
5 - 6 km	2.66
Add for each succeeding kilometre	0.23

807.1 DESCRIPTION

.1 Overhaul rates, when required under an Item, shall be paid to the Contractor by the Owner as set out in Table 807-1 herein.

.2 The overhaul rates are paid for the volume in cubic metres of excavated material measured in its original position; i.e., bank measure, and hauled more than 300 metres.

.3 If the overhaul rates are revised by the Owner during the term of the Contract, the Owner shall pay the Contractor the revised overhaul rates from the date of the revision.

Table 807-1
OVERHAUL RATES
Unclassified Excavation

• effective April 1, 2006 •

Haul Distance	Unclassified Materials $ per cubic metre
0 - 300 metres	freehaul
300 - 600 metres	0.73
600 - 900 metres	1.03
900 - 1200 metres	1.33
1200 - 1500 metres	1.60
1500 m - 2 km	1.89
2 - 3 km	2.16
3 - 4 km	2.42
4 - 5 km	2.66
5 - 6 km	2.91
Add for each succeeding kilometre	0.24

808.1 DESCRIPTION

.1 Overhaul rates, when required under an Item, shall be paid to the Contractor by the Owner as set out in Table 808-1 herein.

.2 The overhaul rates are paid for the volume in cubic metres of excavated material measured in its original position; i.e., bank measure, and hauled more than 300 metres.

.3 If the overhaul rates are revised by the Owner during the term of the Contract, the Owner shall pay the Contractor the revised overhaul rates from the date of the revision.

Table 808-1
OVERHAUL RATES
Solid Rock Excavation

• effective April 1, 2006 •

Haul Distance	Solid Rock $ per cubic metre
0 - 300 metres	freehaul
300 - 600 metres	0.81
600 - 900 metres	1.14
900 - 1200 metres	1.47
1200 - 1500 metres	1.79
1500 m - 2 km	2.10
2 - 3 km	2.40
3 - 4 km	2.66
4 - 5 km	2.93
5 - 6 km	3.19
Add for each succeeding kilometre	0.27

810.1 DESCRIPTION

.1 Fixed rates shall apply for Work performed in the Contract for which there is a defined and finite task.

.2 The rates shall be in accordance with the attached schedule (Table 810-1) and no overheads or mark-ups shall be added to the fixed rates units.

.3 Fixed rates shall only be applied with the approval of the Engineer.

810.2 TERMS and CONDITIONS

.1 The rates as set out in Table 810-1 shall apply to the administration of fixed rate Work.

Table 810-1
Fixed Rates

Item Reference	Description	Unit	Fixed Rate
260 261	Smoothness Retesting	per hour see 810.2.2	$100.00
260	Payment of Appeal Testing Costs (Density)	per core	$40.00
260	Anti-stripping Admixtures - based on total admixture addition per tonne of Actual Asphalt Cement (Note)	per tonne of Actual Asphalt Binder	$15.00
261	Approval of 2nd and Subsequent Mix Design(s)	per mix design	DOT Standard Laboratory Rate
261	Payment of Appeal Testing Costs Density Asphalt Content Asphalt Content and Gradation Thickness Air Voids	lump sum	 $500.00 $400.00 $500.00 $200.00 $500.00
311	Steel H Pile Splices	per splice	$400.00
Note:	If a tendered Quantity is included for an anti-stripping admixture, payment will be made at the fixed rate only if the admixture is required for the Design Mix Formula and is actually incorporated into the asphalt concrete placed on the Contract.		

810.2 .2 The Fixed Rate shall include all time and Equipment required to complete the retesting.

.1 Time required for retesting shall include all travel time, including return, from the DOT office in Fredericton or the site of origin for the crew whichever is the least amount, all standby time and all profiling Work required to test the Work.

811.1 DESCRIPTION

.1 Force Account is defined as foreseen Work that is necessary to be performed on the Contract but for which there is not a Lump Sum or Unit Price in the Contract.

.2 The force account Work shall be defined in the Contract Documents and shall be carried out under a provisional sum.

  .1 The Contractor may submit in writing, for the Engineer's approval and in accordance with GC 44, a Lump Sum or Unit Price for each or any number of the Work activities described under Force Account.

  .2 If the Contractor chooses not to submit a price, or if the Engineer and the Contractor cannot agree on a price for the Work, the Engineer shall prepare a written Work Order for each such Work activity and the Work shall be performed as cost plus in accordance with GC 45.

811.2 TERMS and CONDITIONS

.1 The terms and conditions as set out in Item 812 shall apply to the administration of force account Work.

CONTENTS

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812.3 CLARIFICATIONS OF GC 45 812-2
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  .12 Invoicing 812-6
  .13 Delays 812-7

812.1 DESCRIPTION

.1 Extra Work is defined as Work that is necessary to be performed on the Contract but for which there is not a lump sum or Unit Bid Price in the Contract.

.2 Foreseen Work - Force Account - is described in Item 811.

.3 Unforeseen Extra Work is Work ordered by the Engineer under GC 37.

  .1 Where the determination of the cost of the Extra Work cannot be made under GC 43, and if the Engineer and the Contractor cannot agree on a price under GC 44, the Work shall be performed as cost plus in accordance with GC 45.

.4 The phrase "Extra Work" and the statements referring to it hereinafter shall apply to both Foreseen Work (Item 811) and Unforeseen Extra Work.

812.2 CLARIFICATIONS OF GC 44

.1 The following clarifications are made for the administration of Extra Work performed at lump sum or in-place Unit Price under GC 44.

  .1 Extra Work proposed to be performed by the Contractor on a lump sum or in-place Unit Price basis shall require approval of such price in writing, prior to commencing the Work.

  .2 The Contractor's invoice for the Work shall show only the approved lump sum or the in-place Unit Price times the units accepted in the Work; no detailed breakdown shall be required and no mark-up is allowed.

  .3 If the price submitted for approval is for Work to be carried out by an approved subcontractor (as per 812.3.10), the subcontractor shall submit an invoice to the Contractor as per 812.2.1.2.

812.3 CLARIFICATIONS OF GC 45

.1 Clarifications are made for the administration of Extra Work performed as cost plus under GC 45.

812.3 .2 Work Orders

  .1 Extra Work must be authorized by the Engineer in writing in the form of a Work Order. The Owner shall not pay for any such Work unless a written Work Order has been issued to the Contractor.

  .2 The Work Order shall describe the nature of the Work to be done, the Equipment, labour and materials anticipated to be used, and the Engineer's estimate of the value of the Work.

    .1 This estimate shall be the sole determination of the rate of mark-up to be applied on all invoices for that Work Order.

812.3 .3 Reports

  .1 The Engineer shall record daily, on a "Daily Equipment Report", the Equipment and labour hours expended and materials supplied by the Contractor, subcontractor or Hired Equipment owner on the Extra Work, as agreed to by the Engineer and the Contractor at the end of each Day or shift.

  .2 The Engineer and Contractor shall each sign and retain a copy of these reports. Only the information on these reports shall be considered for payment by the Owner.

812.3 .4 Labour

.1 The Contractor shall show the Actual Basic and Overtime Rates paid for each individual engaged in the Extra Work, plus the various levies paid by the Contractor on the employees' wages.

  .1 The Contractor shall submit, to the Administrative Services Branch of the Owner for approval, a list of the various levies paid for his employees. This list shall initially be submitted upon award of a Contract and shall be verified annually or whenever there is a change in any levies paid or as otherwise requested by the Owner.

.2 The various levies paid by the Contractor must be shown individually, if different from those previously submitted as per 812.3.4.1.1.

  .1 The Contractor must be prepared to substantiate wage rates and all levies shown on the Extra Work Invoices.

.3 Overtime accumulated by the Contractor's employees within the established normal work hours of a calendar week, during which they have worked on Work Order(s) and on other Work for the Contractor, shall be prorated in the ratio of "total hours on each Work Order" to " total hours that week".

  .1 The distributed overtime as calculated in 812.3.4.3 shall be rounded to the nearest half hour.

  .2 In the case where the Contractor extends his normal work hours to Work solely on Work Order(s), the overtime worked during that extended period shall be charged entirely to the Work Order(s).

  .3 The overtime distributed to each Work Order shall be deducted from the total number of hours worked on that Work Order that week to determine the number of regular hours to be paid in each case.

  .4 Where the overtime is paid on daily rather than weekly Work hours, the principle for distributing overtime to each Work Order shall apply, but on a daily basis.

.4 A mark-up shall be added to the total of the Actual Basic and Overtime wages plus levies paid by the Contractor.

  .1 The mark-up shall be 20% if the value of the Work Order is $2,500 or less, and 15% if over $2,500, as estimated by the Engineer under 812.3.2.2.

.5 The number of hours to be paid for the Superintendent and/or foreman, shall be paid for commensurate with the time supervising on the Extra Work.

812.3 .5 Board

.1 The Owner shall pay board allowance to the Contractor, at a daily rate set by the Engineer, for the Contractor's personnel working on Extra Work and boarded in the Contractor's site facilities.

.2 The Owner shall pay board allowance to the Contractor, at a daily rate set by the Engineer, for the Contractor's personnel working on Extra Work and boarded off site at a location not supplied by the Contractor.

.3 A mark-up, as described under 812.3.4.4, shall be paid on board and/or other approved allowances.

.4 For Extra Work which is completed in less than 10 hours per Day, board or other allowances noted in 812.3.5.1 and 812.3.5.2 shall be paid at an hourly rate determined by dividing the daily rate by 10 hours/Day.

.5 For Extra Work requiring more than 10 hours per Day, the daily rate shall apply.

812.3 .6 Materials

.1 Any materials supplied for and utilized in the Extra Work, at the request of the Engineer, shall be invoiced by the Contractor at his supplier's invoice price (excluding the HST), plus a mark-up as described in 812.3.4.4.1.

.2 A copy of the supplier's invoice shall accompany the Contractor's invoice for each separate material item submitted for payment, including materials from the Contractor's stock.

812.3 .7 Equipment

.1 Rates for Equipment shall be as set out in the Machine Rental Regulation (82-113) under the Crown Construction Contracts Act of the Province of New Brunswick.

  .1 Rates for Equipment not listed in the Machine Rental Regulation will be determined by the Engineer upon application, in writing, by the Contractor.

.2 The number of hours to be paid for machine and operator shall be the actual number of hours worked by each machine (rounded to the nearest half hour) and in accordance with Section 2(7) of the Machine Rental Regulation.

  .1 A service allowance of one-half hour service time per Day shall be paid at the full approved rates for machine and operator, provided the machine works 6 hours or more per Day on Extra Work.

  .2 The service allowance does not apply to trucks, floats and other Equipment not normally serviced daily.

812.3.7 .3 Transportation costs of Equipment brought to the Work Site and used exclusively on Extra Work shall be paid if the time spent on Extra Work is 16 hours or less, in accordance with Section 2(8) of the Machine Rental Regulation.

  .1 Travel and/or float costs shall be paid to transport Equipment from another area of the Work Site to and from the Extra Work area if the Extra Work is of 16 hours or less.

.4 Standby time shall be paid at half the applicable rental rate for Equipment brought onto the job site specifically for Extra Work.

  .1 Standby time will not be paid for Equipment that was on the Work Site at the time the Extra Work was ordered.

.5 The number of hours to be paid for vehicles used by the Superintendent and/or foreman, shall be paid for commensurate with the time supervising on the Extra Work.

812.3 .8 Hired Equipment

.1 If Extra Work requires Equipment the Contractor does not own or have at his disposal, such Equipment may be hired by the Contractor from some other source. Equipment so hired will be classified as Hired Equipment and not as a subcontractor.

.2 Rates for Hired Equipment shall be established as per 812.3.7, before the Hired Equipment is used on Extra Work.

  .1 The number of hours to be paid for machine and operator shall be in accordance with 812.3.7.2.

  .2 The rate may include the Equipment's operator cost if that was the basis of hire.

    .1 If the rate includes the operator's cost, the rate shall be considered a flat rate that is full compensation for the wages (regular and overtime), levies and overhead.

  .3 When the Engineer authorizes Equipment to be rented from a rental agency, to be used solely on Extra Work, the Equipment shall be paid for at the rental agency's rate.

    .1 Equipment which rents out at a daily rather than hourly rate shall be paid at the daily rate provided it is utilized solely on Extra Work.

.3 The Contractor shall invoice the Owner the total amount of the Hired Equipment owner's substantiated invoice plus a mark-up defined as follows:

  .1 The mark-up shall be 10% if the value of the Extra Work is $2500 or less, or 5% if greater than $2500, as estimated by the Engineer under 812.3.2.2.

  .2 The Contractor shall clearly mark on his invoice that the Work was carried out by Hired Equipment.

812.3 .9 Private Trucks Hired By The Hour

.1 A 5% mark-up shall be paid on Private Trucks hired by the hour to do Extra Work. This mark-up shall apply to the rate for the truck and the operator's wages.

.2 The Contractor shall not be entitled to reimbursement for the cost of any public liability and property damage insurance in relation to the Private Trucks.

812.3 .10 Subcontracting

.1 The Contractor may have Extra Work performed by a subcontractor approved as per Item 907.

.2 The subcontractor shall invoice the Contractor for labour, board, materials, Equipment and mark-ups as specified in 812.3.4, 812.3.5, 812.3.6 and 812.3.7.

.3 The Contractor shall invoice the Owner the total amount of the subcontractor's substantiated invoice plus a mark-up, as follows:

  .1 The mark-up shall be 10% if the value of the Extra Work is $2500 or less, or 5% if greater than $2500, as estimated by the Engineer under 812.3.2.2.

  .2 The Contractor shall mark on his invoice that the Work was carried out by a subcontractor.

812.3 .11 Public Holidays

.1 The Contractor shall be entitled to payment on Extra Work for wage costs expended on individuals for public holidays which fall within the time period of the Extra Work.

.2 The amount paid to the Contractor shall be the Actual Basic Rate paid the individual, plus any Workers' Compensation levy and plus a mark-up as per 812.3.4.

  .1 No other levies shall be paid to the Contractor.

812.3 .12 Invoicing

.1 Invoices for Extra Work must be submitted on a monthly basis unless otherwise agreed to between the Contractor and Engineer.

.2 Each invoice shall denote the Work Order number, the location, description and date(s) of Work done, and the invoice date.

.3 Each Work Order shall be invoiced separately. A copy of the Work Order shall accompany the Contractor's invoice. In the case where all or a portion of the Work was performed by subcontractors or Hired Equipment and invoiced to the Contractor, the Contractor shall also attach a copy of the subcontractor's or Hired Equipment invoice(s) to the Contractor's invoice submission.

812.3 .13 Delays

.1 The Contractor shall have no claim for hindrances or delays that may be caused by carrying out the Extra Work.

.2 The Contractor may, however, in accordance with GC 15(1) and in accordance with Item 998, submit a request in writing for an adjustment to the Completion Date if it can be demonstrated that the Extra Work has delayed completion of his normal operations.

820.1 Description

.1 Payment Adjustments are amounts added to or deducted from payments due the Contractor, as allowed for Work carried out under other Items.

.2 Some Payment Adjustments may be identified in the Contract Documents under an Item, with a Provisional Sum provided. The quality of the Work performed under the specific Item will determine whether the payment Adjustment will be paid as a bonus or deducted as a penalty.

  .1 Such Payment Adjustments may be for Mat Density and Smoothness under Item 260 or Item 261.

.3 Some Payment Adjustments may be added to the Contract for Work not identified in the Contract Documents, to be paid as a plus or minus adjustment based on quality or quantity of the Work.

  .1 Such a Payment Adjustment may be for Asphalt Binder Content under Item 260 or 261.

.4 Other Payment Adjustments may be added to the Contract for specialized Equipment not specifically required but allowed for and provided, such as a Material Transfer Vehicle under Item 260 or 261.

DIVISION 900

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905.1 GENERAL

.1 Notification of the start date may be provided in the Contract Documents at the time of Tender.

.1 In no case shall any Work be performed prior to the date specified.

.2 The Owner reserves the right to limit the start date of the Work.

906.1 DESCRIPTION

.1 This Item details the Contractor's responsibilities in the preparation and submission of construction Work Schedules and the format and requirements for periodic revisions.

.2 The Initial Work Schedule shall be that schedule submitted by the Bidder, for approval, within 12 Days after the Tender Closing and prior to the time of the Award of the Contract.

   .1 Acceptance of the Initial Work Schedule will not alter the Contract requirements.

.3 The Initial Work Schedule shall be reviewed at the first job meeting by the Contractor and the Engineer.

.4 The Contractor shall attach an updated and revised Work Schedule to the monthly Progress Estimate at time of signing of the estimate.

   .1 If an updated and revised Work Schedule is not attached to the monthly Progress Estimate, then the Progress Estimate will be considered incomplete and, pursuant to GC 48(2), payment of the Progress Estimate will be withheld.

.5 The monthly updated and revised Work Schedule will include information in relation to progress of Work and proposed revisions to the previous schedule and shall include the unaltered Initial Work Schedule information for each Item or task.

906.2 FORMAT

.1 Prepare the Work Schedule in the form of a horizontal bar chart.

.2 Provide a separate bar for each trade or operation or Item.

.3 Provide a horizontal time scale identifying each week by the date of the Monday of that week.

.4 Identification of the schedule descriptions may be by Item number, or any other logical descriptor that may be applicable to the Work and the schedule.

.5 The format for the schedule descriptions may be by the numerical sequence of the Contract Items or by the chronological order of the start of each Item or any other logical progression that may be applicable to the Work and the schedule.

   .1 The critical path of the Work shall be indicated.

.6 Several computer scheduling programs are readily available and the Owner advises that these formats are generally acceptable, however the Contractor is advised to resolve the format and presentation issues with the Engineer prior to the time of submission of the Initial Work Schedule.

906.3 CONTENT

.1 Include the sequence of construction from initiation to completion of the Work.

.2 Include the dates for the commencement and completion of each major element or Item of construction.

.3 Show the percentage of completion of each schedule description as of the last Day of the month for which a Progress Estimate is completed.

.4 Show changes which have occurred in the Work since the previous submission of the Work Schedule, including but not limited to

    .1 major changes in scope,
    .2 activities modified since the previous submission,
    .3 revised projections of progress and completion, and
    .4 other identifiable changes.

.5 Provide a narrative report to define the following topics, if applicable:

    .1 problem areas, anticipated delays and the impact on the Work Schedule, and
    .2 corrective action proposed and its effect.

.6 Include the dates for submitting shop drawings, product data, samples, if applicable.

.7 Include the dates when free issue materials, as defined in Item 908, will be required.

906.4 SPECIFIC REQUIREMENTS

.1 On Grading Contracts :

    .1 The Work Schedule information shall include, but is not limited to, commencement dates, designated areas of excavation and embankment Work, expected production and the time required for completion.

.2 On Paving Contracts :

    .1 The Work Schedule shall outline the sequence of Work with estimated time limits for the various stages or parts of the Work.

    .2 For asphalt concrete this outline should include commencement dates, scheduling of aggregate production, asphalt concrete production rate and placing sequence.

906.4 .3 On Structures Contracts :

.1 The Work Schedule shall outline the sequence of Work along with estimated time limits for the various stages or portions of the Work.

.2 The Work Schedule shall clearly indicate the commencement and completion dates of each phase, stage or portion of the Work.

.4 On Crushing Contracts :

.1 The Work Schedule shall include the planned sequence of crushing for the different sizes of crushed material along with expected production and time limits.

907.1 DESCRIPTION

.1 The Contractor may apply to have portions of the Contract carried out by an approved subcontractor(s).

.2 The Contractor shall apply in writing to the Engineer with the name of the company to be considered for approval as a subcontractor for the Work.

  .1 This submission shall also include a description of the Item(s), estimated Quantities and approximate value of the Work (the approximate Quantity multiplied by the Unit Price for the Item(s)) to be subcontracted.

.3 The Engineer shall approve the subcontractor, by response in writing, to the Contractor prior to the commencement of the Work proposed under 907.1.2.

.4 The Contractor shall ensure that the approved subcontractor is entirely familiar with the Contract Documents and has a copy of the Contract Documents.

.5 The approval for use of any subcontractor shall be exclusive to the Contract under which the application is made.

908.1 DESCRIPTION

.1 All material necessary for the proper completion of the Work, except that listed specifically as being supplied by the Owner, shall be supplied by the Contractor.

908.2 QUALITY OF MATERIAL

.1 All material provided by the Contractor shall be new, unless otherwise approved.

.2 Material supplied by the Contractor shall conform to the requirements of the Contract.

.3 As specified or as requested by the Engineer, the Contractor shall make available for inspection or testing sample(s) of any material to be provided by the Contractor.

.4 The Contractor shall obtain for the Engineer the right to enter upon the premises of the material manufacturer or supplier to carry out such inspection, sampling and testing as specified or as requested by the Engineer.

.5 The Contractor shall notify the Engineer in writing of the sources of supply sufficiently in advance of the material supply dates to enable the Engineer to perform the required inspection, sampling and testing.

  .1 The Owner will not be responsible for any delays to the Contractor's operations where the Contractor fails to give sufficient advance notice to the Engineer in writing to enable the Engineer to carry out the required inspection, sampling and testing before the scheduled supply dates.

.6 The Contractor shall not change the source of supply of any material without the written authorization of the Engineer.

.7 Material which is not specifically identified in the tender but subsequently required in the Work, shall be of a quality best suited for its intended use.

908.3 REJECTED MATERIAL

.1 Rejected material shall be expeditiously removed from the Work Site after notification from the Engineer.

.2 Where the Contractor fails to comply with such notice, the Engineer may require that the rejected material be removed and disposed of outside the Work Site and the Contractor shall pay the costs of removal and disposal of the rejected materials.

908.4 SUBSTITUTIONS

.1 Where the Specifications require the Contractor to supply a specified material/product, the Unit/Lump Sum Price shall be based upon the supply of the material/product so specified, which shall be regarded as the standard of quality required by the Item.

.2 After the award of the Contract, the Contractor may apply, in writing, to the Engineer to substitute another material/product other than the material/product specified in the Contract Documents.

  .1 The submission shall be complete including all technical data and case history applications for the proposed material/product.

  .2 The Engineer may decide not to entertain substitution during the period of the Contract.

.3 Substitution of material(s)/product(s) shall not be made without the prior written approval of the Engineer.

.4 No proposed substitution(s) will be approved prior to the award of the Contract.

908.5 FREE ISSUE OF MATERIAL

.1 The Owner shall make available specific materials, as identified in the Contract Documents, for the Work as free issue.

.2 The Contractor shall be responsible for loading, transporting, unloading, storing and distributing materials from DOT, Fredericton to the Work Area.

.3 The Contractor shall be responsible for all materials and for any damage or loss that may occur from the time of receipt of the materials from the Owner's stock until such time that the materials have been accepted in the Work by the Engineer.

  .1 Any replacement due to loss or damage shall be the responsibility of the Contractor, at his own expense.

908.5 .4 Care of Material

  .1 The Contractor shall, in advance of receipt of shipments of material supplied by the Owner, provide adequate and proper storage facilities acceptable to the Engineer; and on the receipt of such material shall promptly place the material in storage except where it is to be incorporated forthwith into the Work.

  .2 The Contractor shall provide the Engineer, immediately upon receipt of such shipment, copies of bills of lading, or such other documentation the Engineer may require to substantiate and reconcile the quantities of material received.

908.5.4 .3 The Contractor shall be responsible for acceptance of free issue material at the specified delivery point and for its safe handling and storage.

.1 If such material is damaged while under the control of the Contractor it shall be replaced or repaired by the Contractor, at no cost to the Owner.

.2 If such material is rejected by the Engineer due to the quality of material as a result of the manufacture of the material, the material shall remain the responsibility of the Contractor until its disposition has been determined by the Engineer.

.4 Where material supplied and delivered to the Work Area by the Owner arrives at the delivery point in a damaged condition or where there are discrepancies between the quantities received and the quantities shown on the bills of lading, the Contractor shall immediately report in writing such damage or discrepancies to the Engineer who shall arrange for an inspection of the shipment and provide the Contractor with a written release from responsibility for such damage or deficiencies.

.1 Where any damage or deficiencies are reported thereafter it shall be the responsibility of the Contractor to repair or replace the materials, at his own expense.

.5 The Contractor shall account for the full amount of material supplied by the Owner in each shipment and the Contractor shall be responsible and liable for such free issue material after taking delivery.

.1 Such material shall not, except with the written permission of the Engineer, be used by the Contractor for purposes other than the performance of the Work under the Contract.

.6 When containers, reels, crates and other types of packaging from free issue material are no longer required for their original purpose, they shall become the property of the Contractor, who shall dispose of them, outside the Work Site, unless otherwise specified in the Contract Documents.

.7 Where material supplied by the Owner is ordered and stockpiled prior to the award of the Contract, the Contractor shall, immediately upon commencement of operations, check the material, report any damage or deficiencies to the Engineer and take charge of the material at the stockpile site.

.1 Where any damage or deficiencies are reported thereafter it shall be the responsibility of the Contractor to repair or replace the materials, at his own expense.

908.5 .5 Return of Excess Material

.1 Where material is made available to the Contractor in excess of the amount required to complete the Work, such excess material shall remain the property of the Owner on completion of the Work.

908.6 DEMURRAGE AND DAMAGES

.1 The Contractor shall be responsible for the prompt loading, unloading and delivery of all materials for the Work and shall be responsible for any demurrage and storage charges.

.2 In the event of demurrage or damage charges being paid by the Owner, that amount shall be deducted from money owing to the Contractor.

908.7 PARTIAL PAYMENT FOR MATERIALS

.1 Upon written request by the Contractor and in accordance with section 4(2) of the Terms of Payment, the Owner will make partial payment to the Contractor for materials identified in the Basis of Payment of an Item and manufactured specifically for the Contract, delivered to the Work Site and stored in an condition, location and manner acceptable to the Engineer.

  .1 The Owner may make partial payment for the materials prior to delivery, if the materials are acceptably stored at the supplier's yard.

.2 The partial payment will be a provisional unit price for the materials determined by dividing the purchase price (materials and freight per the supplier's invoice as provided to the Engineer) by the unit of measure for the Item or by calculating the percentage of the lump sum price of the Item equivalent to the purchase price. In the case of payment for materials stored per 908.7.1.1, the calculation would exclude the freight cost.

.3 In accordance with section 13(3) of the General Conditions, the Contractor shall be fully responsible for the care of the materials until placed and accepted in the Work, including repair or replacement at his own expense of any materials damaged or lost between the period of the partial payment and the incorporation of the materials into the Work.

.4 Partial payment may only be made in the fiscal year the material is to be incorporated in the Work for the specified Items as follows:

  .1 Items 302, 304, 341, 342, 343, 344, 345, 348, 351, and 555.

912.1 DESCRIPTION

.1 In the employment of persons on a project, there shall be no discrimination by reason of race, sex, age, marital status, national origin, colour, religion, or political affiliation; it being agreed, however, that the foregoing shall not prevent the implementation of special measures designed to benefit groups such as those defined in the Human Rights Act of the Province of New Brunswick.

.2 Regulation 90-149 of The Employment Standards Act for the Province of New Brunswick shall apply.

.3 For jobs with participation by the Government of Canada, as identified in the Contract Documents, recruiting of labour shall be conducted through Canada Employment Centres.

913.1 GENERAL

.1 The Contract award shall require the successful Bidder to comply with terms and conditions as set out in the Insurance Schedule, attached to and forming part of the Contract.

.2 The Insurance Schedule is marked "E" and is attached in the Articles of Agreement.

916.1 DESCRIPTION

.1 The procurement of all signs required pursuant to the Contract shall be the responsibility of the Contractor and shall be in accordance with the requirements of the NBDOT "Work Area Traffic Control Manual" with respect to the Work conditions prevailing at the site.

  .1 Signs shall be made available at DOT, Fredericton, NB.

  .2 Signs shall be charged out at the Owner's current listed price for these materials and this amount shall be deducted from the first Progress Estimate.

.2 Signs used in the Contract shall remain the property of the Owner and shall be returned to the DOT District office after completion of the Contract.

  .1 Credit shall be given on the final Progress Estimate for signs returned in good condition, as per 916.1.1.2.

.3 Signs shall be located, erected and maintained by the Contractor in accordance with the NBDOT "Work Area Traffic Control Manual".

.4 All Work associated with the signage of the Contract shall be the sole responsibility of the Contractor.

.5 The Engineer shall issue an immediate cease Work order for any Work not in compliance with the terms set out in the NBDOT "Work Area Traffic Control Manual" and the Contractor shall immediately comply with such an order.

  .1 The Contractor shall immediately make whatever adjustments are necessary in order to comply with the terms set out for the particular style of Work as defined in the NBDOT "Work Area Traffic Control Manual".

  .2 Any lost time resulting from non-compliance shall not be considered, by the Owner, for any extension in the Contract Completion Date.

917.1 DESCRIPTION

.1 This Item details the Contractor's responsibility to provide any and all Traffic Control Persons (TCPs) as may be required for various types of Work performed under the Contract.

.2 For the purposes of this Item, Work Area may encompass more than one Work operation, as approved by the Engineer.

917.2 REQUIREMENTS

.1 The Contractor shall carry out the Work in accordance with the latest edition of the WATCM.

  .1 Further to Chapter 5 of the WATCM, the Contractor shall be responsible to provide as many TCPs as required, based on Roadway geometry, traffic patterns, traffic volumes, size or length of Work Area and other pertinent factors.

  .2 Supply of all necessary safety equipment and apparel for TCPs shall be the responsibility of the Contractor.

  .3 The Stop/Slow paddle will be available from the Owner in accordance with Item 916.

917.3 OTHER

.1 Notwithstanding 917.1 and 917.2, separate payment will be made by the Owner for TCPs approved by the Engineer for the following types of Work:

  .1 Force Account Work identified under Item 811 in the Contract Documents; and/or

  .2 Extra Work (of a nature or style not identified in the Contract Documents) carried out under Item 812.

918.1 DESCRIPTION

.1 The Contractor shall construct detours at the location(s) and to a standard as indicated in the Contract Documents.

  .1 Such detours have been incorporated in the Contract estimated Quantities and will be paid for in accordance with the applicable Items.

.2 Traffic control devices required for detours shall be in accordance with the requirements of Item 916 and the WATCM.

.3 No Work shall begin on a detour until approval is received from the Engineer.

.4 The Contractor shall ensure that all required traffic control devices are in place and operational 24 hours a Day from the time immediately preceding the opening of the detour and shall remain operational for the duration of the detour operation.

.5 Temporary construction detours, other than those indicated in the Contract Documents, must be approved by the Engineer prior to construction.

  .1 Construction, maintenance, and removal of such detours shall be the responsibility of the Contractor.

919.1 GENERAL

.1 The Contractor is advised that any existing traffic pattern(s) or alternate traffic pattern(s) must be maintained and kept open, at a minimum of one traffic Lane throughout the work day and must be open to two-way traffic at the end of the work day.

.2 The Contractor shall schedule his Work to provide for the safe and efficient flow of traffic throughout the Work Site in accordance with the WATCM.

.3 Surfaces subject to through traffic shall be maintained in a condition such that traffic can safely travel along it at the speed limit posted for the Work Area.

921.1 HAUL ROADS

.1 Haul roads are off-Highway access to material sources required for Highway construction.

.2 The Contractor shall carry out the Work in conjunction with Item 948.

.3 Haul roads shall be constructed in a location as approved by the Engineer, and in a manner to provide safe and reasonable access for the Engineer.

.4 Construction, dust control and maintenance of all haul road(s) shall be the Contractor's responsibility except :

  .1 Construction of haul roads on lands controlled by the Owner, and as indicated in the Contract Documents or as directed by the Engineer, shall form part of the Work.

921.2 WORK AREA ACCESS ROADS

.1 Access to the Work Area shall be the responsibility of the Contractor.

.2 Access roads shall be constructed in a location as approved by the Engineer, and in a manner to provide safe and reasonable access for the Engineer.

.3 Construction, dust control and maintenance of the access road shall be the Contractor's responsibility.

.4 Construction of access roads may be directed by the Engineer and if so, construction shall be paid for by the Owner.

921.3 ENVIRONMENTAL PROTECTION

.1 The Contractor shall ensure that his use of any existing private or public access roads does not cause sedimentation of any watercourses that cross such roads.

.2 On any new access roads constructed by or for the Contractor, natural water flows shall not be impeded, ditches shall not drain directly into watercourses, and erosion shall be controlled.

.3 A vegetated buffer zone shall be maintained between an access road and any watercourse, to the extent possible.

922.1 DESCRIPTION

.1 Notwithstanding the Ownership of the property the Contractor shall operate all pit and quarry sources in such a manner that the Work places are maintained in a neat and safe condition at all times during the period of the Contract and in accordance with the laws of municipalities, the Province of New Brunswick and the Government of Canada.

.2 The Contractor shall be responsible to ensure he has obtained all permits, leases and other regulatory requirements pursuant to the laws of municipalities, the Province of New Brunswick and the Government of Canada for the operation of his Work, and copies of the relevant documents shall be provided to the Engineer before commencing the Work.

.3 Where the source of supplies for pits and quarries is located on land controlled by the Owner, a royalty fee of 25 cents per tonne shall be paid by the Contractor to the Owner.

- .1 Where materials are made available from excavation within the Work Site, the royalty fee of 25 cents per tonne will not apply.

.4 The Contractor shall be responsible, at his own expense, for the development and maintenance of the source.

- .1 Where the source is located on land controlled by the Owner, and is specified in the Contract Documents, the Owner shall compensate the Contractor, in accordance with the specific requirements outlined in the Contract Documents, for the development of the pit or quarry.
- .2 Where the source is identified in the Contract Documents as being within the Work Site, it will be considered a pit or quarry in accordance with this Item, except that the Work described under 922.1.7 shall be carried out under the appropriate bid Items.

.5 The Contractor shall operate the source in such a manner so as not to limit the ability to mine additional areas of the source in the future, by either his own forces or others.

- .1 Sources within the Work Site shall be operated as specified in the Contract Documents.

.6 The Contractor shall make every effort to optimize the use of the resource and shall adjust his Work to achieve the minimum of waste from the mined materials.

- .1 Where the source is owned or controlled by the Owner the Contractor shall, in the case of a quarry, process all oversize material produced during the course of the Work and in the case of a pit, process all naturally occurring rocks up to 400 mm in greatest dimension.

922.1 .7 The Contractor shall clear, grub and strip the Overburden from the source over an area sufficiently large enough to ensure that no contamination of the source materials will occur during drilling, blasting and excavation.

.1 Consolidated Overburden shall be stripped back a minimum distance of 2 m from the face; unconsolidated Overburden shall be stripped back a minimum distance of 7 m. from the face.

.2 The waste material shall be removed from the Work Area and disposed of in accordance with the laws of municipalities, the Province of New Brunswick and the Government of Canada.

.3 The location of the waste disposal site shall be such that any runoff or sediment-laden water draining from this area cannot impact on any stockpile area(s) or future use of the site.

.8 The Contractor shall be responsible to restore the areas affected by his Work and in accordance with the permits, leases and other requirements identified in 922.1.2.

922.2 SULPHIDE-BEARING ROCK

.1 Aggregate Base/Subbase, Shoulder Material and Random Riprap made from quarried rock shall have a total sulphur content of less than 0.3%; or a Neutralization Potential (NP) at least three times the Acid-generating Potential (AP), as represented by the Neutralization Potential Ratio, where $NPR = NP/AP \geq 3$.

.2 The NPR shall be determined by the Modified Sobec procedure (acid-base accounting), based on total sulphur.

EXAMINATION OF SOILS INFORMATION

ITEM: 926

926.1 DESCRIPTION

.1 Prior to submitting a Tender quotation, the Bidder shall have access to and may examine, at the Owner's normal place of business, the record of all borings, test excavations, and other subsurface investigations and soil analyses, if any, made for design of the Work, the records of which may or may not be shown on the Plans.

.2 Any subsurface information available is based on the investigation made at the specific locations indicated. The Owner makes no guarantees, representations, warranties, either expressed or implied, with respect to any such information, and cautions the Bidder that these conditions are not necessarily typical and may have changed since the field data were collected.

.3 The Owner makes no guarantees, representations or warranties, either expressed or implied, that the presence or absence of water on the site and any subsurface explorations when made, will be representative of the actual conditions at the time of construction.

927.1 GENERAL

.1 Asphalt Concrete Core Data are provided by the Owner solely for the Bidder's/Contractor's information.

.2 Any Asphalt Concrete Core information available is based on the investigation made at the specific locations indicated and the Owner makes no guarantees, representations, warranties, either expressed or implied, with respect to any such information, and cautions the Bidder/Contractor that these conditions are not necessarily typical and may have changed since the field data were collected.

.3 Responsibility for interpretation and use of Asphalt Concrete Core Data in preparing a bid shall be that of the Bidder.

928.1 GENERAL

.1 The Owner may require that geotechnical instrumentation be installed, by the Engineer or by others, within the Work Area and during the period of Work under the Contract.

  .1 Installation and other pertinent details relating to the geotechnical instrumentation shall be as listed in the Contract Documents.

    .1 Where the need for geotechnical instrumentation, of an emergent nature, occurs during construction, locations and installation details will be determined by the Engineer, in consultation with the Contractor.

    .2 To expedite the installation and reading of the geotechnical instrumentation, the Contractor shall provide access and other assistance, as deemed necessary and appropriate by the Engineer.

  .2 In the immediate area of the geotechnical instrumentation, where normal methods of fill placement and compaction do not ensure the integrity of the instrumentation, the Contractor shall supply fill material with a maximum particle size of 75 mm, and this material shall be placed and compacted by hand around the instruments.

    .1 The placement of hand placed material shall be concurrent with the surrounding fill, which is to say that the fill elevation immediately surrounding the instruments shall be at the same elevation, within 0.5 m, of the surrounding work.

    .2 The extent of the hand placement of fill will be determined by the Engineer, based on the material, equipment and methods used by the Contractor which have been deemed to endanger the integrity of the geotechnical instruments.

  .3 It is imperative that this instrumentation remain intact and serviceable throughout the project.

  .4 The Contractor shall organize his activities to ensure that the geotechnical instrumentation is not damaged, or rendered inaccessible or unusable.

  .5 Geotechnical instrumentation damaged by the Contractor's operations shall be repaired or replaced by the Engineer, at the Contractor's own expense.

    .1 The Engineer will endeavour to effect the repairs or replacement as soon as possible, however any additional cost due to delays will be the responsibility of the Contractor.

  .6 Continuity of records is essential.

    .1 If instrumentation is damaged or destroyed, the Engineer may impose limitations or restrictions on the Work within the area subject to monitoring.

931.1 WEIGHING DEVICES

.1 The Contractor shall supply the scales necessary for determining the quantities for Contract Items that specify measurement for payment by the tonne or other mass unit.

.2 All weighing devices shall be of a size to safely and legally weigh loads as described herein and shall be installed at a location that has been approved by the Engineer for the scale placement.

.3 Belt scales shall not be used unless inspected and approved by Measurement Canada (MC).

  .1 The Engineer reserves the right to request periodic checks to be made by weighing loads on approved truck platform scales.

  .2 All costs associated with the periodic checks shall be borne by the Contractor.

.4 Truck platform scales will be subject to the requirements of 931.3.

.5 The cost of supplying, setting up, any adjustments or repairs as required, and dismantling of weighing devices shall be borne by the Contractor.

.6 If the Owner requires that the Contractor move his scales after the initial set-up, the Owner will pay for the cost of the move.

931.2 WEIGHING PROCEDURES

.1 The weighing procedure to be followed by the Owner's weighers on Contract Work or other Work for the Owner will be carried out for determining payment quantities only.

.2 The truck driver shall be responsible to ensure that the legal axle limits are not exceeded.

.3 Any material hauled in excess of the maximum weights provisions of Regulation 2001-67, Vehicle Dimensions and Mass Regulation under the NB Motor Vehicle Act, will not be paid for or considered eligible for payment as part of the Work under any Item of the Contract.

.4 The Contractor must ensure all trucks and other hauling units are properly registered to legally carry the gross weights they intend to haul on the Highway.

.5 All hauling units used in the Work shall be tared at the start of the Work and at least once during every week in which they haul material weighed under the Contract, and more frequently if requested by the Engineer.

.6 Tare and gross weights of hauling units shall be recorded typically to the nearest 10 kg, or in the case of a beam scale, to a maximum of the nearest 50 kg.

931.3 TRUCK PLATFORM SCALES POLICY

.1 The following policy shall apply to the Contractor's truck platform scales used on the Contract.

.2 The term "scales" used hereinafter shall mean permanent and portable truck platform scales.

.3 MC will no longer do request inspections of the Contractor's scales for the first set-up of the calendar year nor annual inspections of scales left in place over twelve months.

.4 The test weights at the Saint John MC office are for use by MC personnel only and will not be made available for use by the Contractor or a Private Scale Company.

  .1 The term "Private Scale Company" shall mean any of the companies listed in Table 931-1 having standard test weights meeting the requirements of 931.5.

.5 MC will do control (random) checks of contractors' scales throughout the year.

  .1 If, for measurement errors, the scales have been rejected by an MC inspector at a control check (random or unscheduled inspection), the Contractor shall make the necessary adjustments or repairs and request MC to reinspect the scales to permit them to be used again.

    .1 Upon request by the Contractor to MC to inspect scales rejected by MC on a control check, the MC inspector will advise the Contractor of his availability to do the reinspection. If the MC inspector is not available the Contractor shall arrange reinspection by a Private Scale Company. In either case, the reinspection will be at The Contractor's expense.

.6 Upon the request of the Engineer, the Contractor shall engage a Private Scale Company to do random checks in order to verify calibration of certain scales.

  .1 After being given notice by the Engineer that the scales are to be checked, the Contractor may continue using the scales but shall make no adjustments to the scales until the inspection is carried out.

  .2 The Contractor shall have the inspection carried out by a Private Scale Company within 7 Days of the Engineer's notice.

  .3 If the inspection proves the scales are accurate without adjustments or repairs, the Owner will pay the Private Scale Company's charge for the inspection.

  .4 If the inspection proves the scales are not accurate, the Contractor shall pay the Private Scale Company's charge for the inspection.

    .1 The scales shall not be used again until necessary adjustments or repairs have been carried out and the scales recertified as accurate, all at the Contractor's expense.

931.3.6 .5 The cost of any delay to the Contractor for the time the scales are out of use because of the inspection requested by the Engineer will not be paid by the Owner, nor will it form the basis of any claim.

.7 The Contractor shall be responsible for the mechanical condition and proper operation of the scales to correctly weigh, within designated tolerances, materials used on the Contract, whether the scales are owned by his company, a subcontractor, a supplier or other.

.8 The Contractor shall ensure that the scales have been inspected by a Private Scale Company as per 931.3.8.1 and have affixed thereon a test sticker bearing the Private Scale Company's name or logo, the date of inspection, the inspecting technician's signature, and any pertinent remarks.

.1 Inspections shall be carried out for each set of scales in the following cases:

.1 For the first set-up of the calendar year;

.2 For each subsequent set-up that same year if moved;

.3 Prior to the first use in the following year if not moved;

.4 Every twelve months if the scales are a permanent installation.

.2 Each inspection as per 931.3.8.1 will be at the Contractor's expense.

.3 The Private Scale Company's test sticker shall not be removed until superseded at the next inspection performed as per 931.3.8.1.

.9 Scales that do not have a dated sticker stating that they are in proper calibration will not be accepted for use on the Owner's Work.

.10 A report (statement of accuracy) shall be completed by the Private Scale Company for each inspection and distributed as follows: the original to MC, and a copy to the Engineer or posted in the scales.

931.4 OPERATION OF TRUCK SCALES

.1 While it is acceptable to affix guiderail, curbing or other edge barriers, to the scale deck to prevent vehicles from running off the edges, the use of timbers or other means to extend the width of a scale deck beyond the width specified in the MC Notice of Approval issued for the particular device type, is not permitted.

.2 Extra-wide vehicles (off-road trucks, scrapers or loaders) must be weighed on extra-wide scales, designed and built to weigh such vehicles.

.3 Scales with a deck having no guiderail or curb on the scalehouse side, or so narrow that the wheels of Equipment being weighed protrude over the edge(s), will be subject to closure under Section 32.1 of the Occupational Health and Safety Act.

931.4 .4 The Contractor shall not "split-weigh" vehicles to determine the weight of a load for payment. Scales must be provided which are long enough to fully support all axles of the vehicle being weighed.

  .1 Split weighing is acceptable only as a means of estimating the axle weights.

.5 Each approach to the scales shall be maintained level at the same plane as the scale deck for a distance of at least 3 m from the end of the deck.

.6 Scales shall not be used at any time which are poorly set up, damaged and/or inaccurate or otherwise improperly installed. Scales which have been struck or jarred or are jamming or reading erratically shall be shut down immediately, notwithstanding 931.3.6.

931.5 TEST WEIGHTS AND TOLERANCES FOR SCALES

.1 Testing of scales, regardless of type of scale or type or value of material weighed on them, shall require a minimum of 10 000 kg (20 000 lb) of test weights that have been certified by MC within the previous twelve months. Test results shall be within the applicable limit of error as specified by the Non-Automatic Weighing Device (NAWD) Specification.

931.6 SCALE HOUSE

.1 The Contractor shall provide a scale house meeting the following minimum requirements:

  .1 A minimum work area of 2.5 m by 1.8 m with a minimum height clearance of 2.1 m, containing a functional desk and chair.

  .2 A minimum room temperature of 20 °C, and adequate ventilation.

  .3 Sufficient lighting to the level of intensity and of the quality defined by the standards for the type of Structure defined and the Work being performed.

  .4 An approved and maintained first-aid kit mounted on the wall at an accessible location on the interior of the house.

.2 The Contractor shall provide a safe means of access to and egress from the scale house.

.3 All roads leading to the scale house shall be maintained so as to provide a safe passage for vehicles, and dust control shall be maintained within 30 metres of the scale house.

.4 The Contractor shall provide toilet facilities in close proximity to the scale house for the weigher.

931.7 PRIVATE SCALE COMPANIES

.1 Table 931-1 lists the Private Scale Companies which have test standard weights which MC have certified for calibrating and checking contractors' truck platform scales.

Table 931-1
Approved Private Scale Companies

RUT	Gsfefs dupoOC	61 569 261
mm f iu T tufnt 3113 Jod	Gsfefs dupo- OC	911 6 4 :455
Cbmbodf Fy fsut	Tifscspplf- RD	92: 6 614
Cbmbodft Frv nfout Dvm ob sft Wbs fu t Mu f	Tu Jt epsf- OC	61 469 2:::
Nfuumfs Upmfep Jod	Npodupo- OC	911 4 656
Tipsf f iu T tufnt	Gsfefs dupo- OC	61 56 3 56
f i Uspo y Dbobeb	Gsfefs dupo Ebsunpvui- OT Rvfcfd- RD	61 565 5121 911 6 6 99: 529 946 2 3
Opuf> efou g ft bddsfe ufe s buf TlDpn bo ft uibu nb fsgpsn o u bm ot fdu po		

931.7 .2 This list may be expanded as additional scale companies acquire test standard weights that are certified by MC.

.3 Any of the Private Scale Companies listed above who are found by MC to be no longer capable of providing inspection services will be struck from the list.

.4 Contractors are advised to verify the acceptability by the Owner of any company either appearing or not appearing on this list prior to tendering on the basis of that company.

.5 The Owner shall maintain a current listing of all qualified firms and that list may vary from the one included in this section. This list will be made available to any Contractor who wishes to review this information for tendering or Contract purposes.

.6 The Contractor's own standard test weights may be used in the inspection of scales, provided these weights have been certified within the previous twelve months by MC and the inspection is performed by a Private Scale Company technician.

.7 Measurement Canada may be contacted as follows:

Measurement Canada
PO Box 2294 Station J
4180 Loch Lomond Road, Building 49
Saint John, N.B.
E2L 3V6 phone : 506-636-4591

932.1 GENERAL

.1 The purpose of this Item is to specify the Contractual provisions which will be followed by the Contractor to ensure that the owners of "Private Trucks" receive a reasonable distribution of the available Work and that they are paid for that Work in a timely manner and at rates as specified in Division 800 of the Contract Documents.

.2 The Contractor shall do all that is necessary to ensure that the purpose of this Item is achieved.

932.2 DEFINITIONS

.1 For the purpose of this Item, the following definitions shall apply:

- .1 "Truck" means a straight truck, or a truck-tractor with or without a trailer.
- .2 "Company Trucks" means a truck legally owned or leased by the Contractor and includes:
  - .1 any truck, legally owned or registered in the name of an officer or the name of the spouse of an officer of the Contractor,
  - .2 any truck leased by the Contractor for or on behalf of a "Local Resident",
  - .3 any truck leased by the Contractor to a "Local Resident", and
  - .4 any truck, the registration of which has been transferred from the Contractor to a "Local Resident" (this includes franchise transfers).
- .3 "Private Truck" means a truck legally owned or leased by a "Local Resident", other than a lease arrangement within the definition of "Company Truck".
- .4 "Local Resident" means a person having residence or a corporation having its principal place of business, in the area in proximity to the limits of the Contract for a period of three months or more prior to the date of the Contract.
- .5 "Pay Period" means each two week period, during the term of the Contract, commencing on the Monday of the week in which the first Private Truck worked on the Contract, and continuing in two-week periods thereafter.

932.3 APPLICATION

.1 This Item applies to the hauling of filter material, Aggregate Base/Subbase, shouldering material, blending sand, topsoil and asphalt concrete both within and outside the limits of the Contract.

.2 This Item also applies if the Contractor chooses to haul any of the above-noted materials to a stockpile, to be reloaded for incorporation into the Work at a later date.

.3 This Item does not apply to the movement or hauling of any other type of material including but not limited to excavation, Borrow, backfill, riprap, or reclaimed asphalt concrete.

932.3 .4 The Contractor shall carry out the Work in such a way that no more than 25% by weight of the tendered Quantity of each material to which this clause applies is hauled by "Company Trucks".

.1 The remainder (75%) of each material to which this clause applies is to be hauled by "Private Trucks", regardless of the tendered or actual Quantity of material.

.5 The Contractor shall stop using "Company Trucks" to haul a material to which this clause applies when 25% by weight of the tendered Quantity of that material has been hauled by "Company Trucks".

.6 The Owner shall refuse to weigh and pay for any material hauled by "Company Trucks" in violation of this clause.

932.4 CONDITIONS

.1 When "Private Trucks" are hired the following conditions shall apply:

.1 The Contractor shall be responsible for the hiring of "Private Trucks" required on the Contract.

.2 The Contractor shall give Private Truck owners at least 24 hours notice of the requirements for trucks on the Contract.

.3 "Private Trucks" must be properly equipped, registered, and insured for the Work for which they are hired.

.4 "Private Trucks" not available at the time of request by the Contractor, or who leave this Contract for other work, do not later have the right to "bump" "Private Trucks" already hired or "Company Trucks" hauling the 25% allotted to the Contractor.

.5 "Private Trucks" shall be hired in a fair and reasonable manner and without regard to membership in any organization. In the event the Owner determines that the Contractor is not distributing the Work under this Item in a fair and reasonable manner, the Owner may direct the Contractor to hire "Private Trucks" in accordance with this clause.

.6 One Private Truck shall, if available, be hired from each "Local Resident" before a second Private Truck is hired from the same "Local Resident".

.7 The Contractor shall, within one week after each "Pay Period", pay the owner of each Private Truck, in full, for the Work done, by the Private Truck on the Contract during the "Pay Period".

932.4.1 .8 The Contractor shall pay the owner of each Private Truck haulage rates not less than the haulage rates set out in Items 801 and 802. There shall be no deductions of any kind whatsoever from the amount paid to the owner of the Private Truck by the Contractor save and except deductions for overweight material in accordance with the provisions under Item 931, fuel supplied by the Contractor and/or Workers Compensation deductions. The amount to be deducted by the Contractor from the owner of the Private Truck for materials hauled overweight must be posted in a visible location at the Scale House at all times during the period that "Private Trucks" are hauling any materials on this Contract.

.9 In the event the Contractor does not pay the owner of the Private Truck in full and in a timely manner as stated above, the Owner may pay the owner directly, pursuant to the provisions of GC 20. In the event of direct payment by the Owner to the owner of the Private Truck, the Owner shall deduct from any amount due and payable to the Contractor under the Contract, the amount paid to the owner of the Private Truck plus an administration cost of 20% of that amount, which is to the extent of the deduction, a discharge of the Owner's liability under the Contract to the Contractor.

.10 The Contractor shall not enter into an agreement with the owner of any Private Truck to haul material on the Contract at a rate less than the haulage rates set out in Items 801 and 802. In the event that the Owner determines that the Contractor has entered into such agreement, the Owner may pay the owner of the Private Truck in accordance with 932.4.1.9, notwithstanding the terms of the agreement between the Contractor and the owner of the Private Truck.

.11 The Owner may at any time or on a regular basis require the Contractor to provide proof of payment by the Contractor to the owner of any Private Truck. The proof of payment shall include but not be limited to:

.1 the amount and type of material hauled by the Private Truck,

.2 the date(s) the material was hauled,

.3 the distance of the haul or hours of Work, if hired on an hourly basis,

.4 the total amount paid by the Contractor to the owner of the Private Truck, and

.5 the amount of any deductions made by the Contractor from the payment to the owner of the Private Truck.

.12 The Owner may at any time carry out an audit on the records of the Contractor pursuant to GC 47 to verify payment to the owner of a Private Truck.

933.1 DESCRIPTION

.1 The purpose of this Item is to identify under what conditions Heavy Equipment may be used in highway and bridge construction.

933.2 DEFINITIONS

.1 For the purposes of this Item the following definitions apply:

.1 Heavy Equipment means scrapers, rock trucks, overweight straight or trailer dump trucks, front-end loaders and like Equipment used to transport materials.

.2 Rock means fractured rock produced from any type of bedrock suitable for Roadbed construction, whether excavated under Item 108 or 161 or imported under Item 121.

.3 Common material means any type of soil suitable for Roadbed construction, whether excavated under Item 106, 107 or 161, or imported under Item 121. It can also mean a mixture of soil and rock, either naturally occurring as in the zone of weathered rock above more competent bedrock, or mixed by the Contractor's method of excavation and loading.

.4 Sub-subgrade means the surface at a specified depth below Subgrade in undercuts and the top of embankments. The specified depth is usually 600 mm but may be a lesser or greater depth depending on the nature of the underlying material.

.5 Backfill means the layer of Borrow A-quality material placed on the sub-subgrade surface to Subgrade elevation in cuts or embankments.

933.3 USAGE OF HEAVY EQUIPMENT

.1 Heavy Equipment may be used to build and/or haul materials on rock Subgrade, as in a solid rock cut, or any fill that has rock comprising at least the top 1 m of Subgrade.

.2 Heavy Equipment may be used to build and/or haul on common material Subgrade provided such usage does not damage the Roadbed.

.1 Damage to the Roadbed is defined as, but is not limited to, rutting that gets progressively worse, or contamination such as waste material spilling from the hauling units.

.3 Heavy Equipment may haul over backfill material that forms the top layer of a common material embankment as long as there is no rutting or pumping of the underlying material. If such rutting or pumping occurs, hauling with Heavy Equipment shall cease immediately.

.1 After completing repairs, if any, in accordance with 933.4.1, the Contractor may resume hauling if he uses trucks that meet the axle mass requirements of Regulation 2001-67, or if he surcharges the Subgrade to allow hauling with Heavy Equipment.

931.3.3 .1 The surcharge shall consist of the same material as used for backfill, and shall be placed along the Subgrade Shoulder to provide at least 1 m of cover over the sub-subgrade and sufficient width for at least one-way travel for a loaded vehicle.

.2 When hauling over the surcharge is finished, the surcharge material shall be incorporated as backfill to Subgrade elevation by means other than with Heavy Equipment.

.3 The surcharge material will be measured for payment under the approriate bid Item when incorporated as backfill. The operation of removing and incorporating the surcharge as the backfill layer will not be measured for payment.

.4 Heavy Equipment is prohibited from hauling over common material undercuts during and after placement of backfill material, unless a surcharge is constructed as described in 933.3.3.1 through 933.3.3.3.

.5 Heavy Equipment is prohibited from hauling along any Roadbed surface constructed above Subgrade elevation, including Aggregate Subbase, Aggregate Base and Pavement.

.1 If the Contract consists of upgrading an existing Highway, hauling with Heavy Equipment above Subgrade may be allowed, as follows:

.1 Only on sections of the existing road that will be excavated or built up within the same calendar year to form a new Subgrade; and

.2 Only if the existing Roadbed does not start to deteriorate and/or the hauling operation does not become unsafe.

.6 The approval of the Engineer is required prior to Heavy Equipment hauling over Culverts with less than 3 m of fill.

933.4 OTHER

.1 The Contractor shall make all necessary repairs to the Roadbed damaged by hauling operations, and complete such repairs to the satisfaction of the Engineer.

.2 Failure of the Contractor to stop hauling when so ordered may result in suspension of his operations in accordance with GC 18.

.3 Any delays and costs to the Contractor resulting from performing repairs or suspension will not be considered as a basis of claim for extra costs or extension of the Limited Funds date, Specified Work Date or Completion Date, as the case may be.

934.1 GENERAL

.1 All trucks Working on the Contract and having a registered vehicle mass greater than 4535 kilograms are to be equipped with a properly functioning, audible, automatic back-up alarm.

936.1 DESCRIPTION

.1 This Item details the general requirements to be carried out with respect to compaction of soil, aggregate and RAP construction materials, by the Contractor.

936.2 SOIL and AGGREGATE

.1 All Roadbed materials shall be placed in lifts of a loose thickness not greater than that specified in the Item under which the material is excavated or supplied, and compacted to at least the specified percentage of maximum dry density uniformly throughout the lift.

  .1 Frozen materials shall not be incorporated into the Roadbed, and Roadbed materials shall not be placed on a frozen Roadbed surface without prior approval of the Engineer.

.2 For most soils, and for Aggregate Base and Shoulder Material, the maximum dry density will be determined by ASTM D698.

  .1 If the sample used in carrying out ASTM D698 has greater than 5% but less than 30% of oversize particles (retained on the 19 mm sieve), the maximum dry density will be the corrected value determined as per ASTM D4718.

  .2 If the material being placed in the Work has a percentage of oversize particles more than 5% higher or lower than the percentage in the sample of 936.2.2.1, the maximum dry density will be the value calculated using the actual field percentage of oversize, as per ASTM D4718.

  .3 For coarse granular materials and Aggregate Subbase the maximum dry density will be determined as per ASTM D4253.

.3 For Aggregate Base/Subbase and soil, the Contractor shall take all necessary measures to ensure that the moisture content is such that compaction is achieved in accordance with 936.2.1 and the following:

  .1 For Aggregate Base/Subbase, the moisture content shall be such that compaction is achieved without adversely breaking down or segregating the aggregate (such that its gradation falls outside the specified grading limits, as determined by sieve analyses on random samples of the compacted in-place material).

    .1 The average moisture content of Aggregate Base/Subbase shall not be less than 3% at time of compaction.

  .2 For soils placed in the top 1.2 m to Subgrade in embankments, the moisture content shall be a value not greater than the optimum moisture content as defined by ASTM D698 or the saturated moisture content as defined by ASTM D4253, and such that no rutting damage, as defined by 933.1.4.1, occurs upon completion of compaction.

936.2 .4 The Contractor shall note that the moisture density relationship (maximum dry density - optimum moisture content), and more precisely the moisture density relationship at a specified compactive effort, is a unique parameter for each soil and/or aggregate matrix considered, and the Contractor shall be responsible for the placement of the material at the appropriate moisture content for compaction efficiency.

  .1 In the event material is too dry for compaction as specified herein, the Contractor shall apply water to the area to be compacted in order to increase the moisture content of the soil or aggregate.

  .2 In the event material is too wet for compaction, as specified herein, the Contractor shall decrease the moisture content of the soil or aggregate.

.5 The energy imparted to the soil shall be sufficient to achieve the specified density, as determined by one of the following ASTM tests: D1556, D2167 or D2922.

.6 No subsequent lifts shall be placed until the preceding lift has been verified as meeting the minimum compaction criteria defined.

.7 A test strip may also be used to determine a control density and the number of passes of compaction equipment required to achieve this result.

  .1 The test strip shall be performed on a lift of placed material with density tests taken after each pass of a compactor until an insitu maximum dry density (control density) is achieved. This procedure will continue until the density result remains constant or decreases. The test strip determines the maximum number of passes, control density and field moisture content.

  .2 The compaction equipment to be used for test strips shall be able to produce a uniform density throughout the lift and have a minimum mass of 9 tonne and a vibratory capacity of at least 1500 vpm.

    .1 Smaller compactors will be allowed for test strips at Culverts.

936.3 RAP

.1 Compaction of RAP placed as Aggregate Subbase, Aggregate Base or shoulder material will be considered to be achieved upon completing the roller pattern approved by the Engineer

936.4 APPLICATION of WATER

.1 All application of water shall be carried out in accordance with Item 191.

941.1 DESCRIPTION

.1 Unless otherwise noted, the Engineer shall furnish and set stakes, marks and furnish data as he deems necessary to establish lines and grades required for the Work.

.2 Before commencing the Work, the Contractor shall satisfy himself as to the meaning of all stakes, marks and measurements.

.3 Claims will not be considered because of alleged inaccuracies unless the Contractor notifies the Engineer, in writing, in sufficient time to allow for the verification or checking of stakes, marks or measurements by the Engineer.

.4 The Contractor shall notify the Engineer of his requirements for stakes and/or marks, at least 3 Days in advance of starting each operation requiring staking or marks.

.5 The preservation of stakes and marks that have been set by the Engineer for the convenience and/or the guidance of the Engineer and the Contractor, shall be the responsibility of the Contractor.

.6 Construction stakes or marks carelessly or wilfully destroyed or disturbed by the Contractor, will be replaced by the Engineer.

  .1 The cost of replacing or restoring such stakes and/or marks will be at the Contractor's own expense.

  .2 This cost shall be deducted from any monies that are due to the Contractor.

.7 The Contractor shall furnish, set and paint barricades around stakes and marks when and as required.

.8 The Contractor shall furnish and set all batter boards.

.9 The Contractor shall ensure access for the Engineer for the checking and control of lines and grades.

.10 If, during the construction operation, the Contractor finds that the location of the Engineer's control point stakes or marks would interfere with his operations, the Contractor shall notify the Engineer, in writing, at least 7 Days in advance of starting the operations which are in conflict with the control point locations.

  .1 If it is determined by the Engineer that these stakes or marks are in conflict, the Engineer shall relocate these stakes and /or marks as identified by the Contractor.

.11 Standard stake markings shall be as indicated on Standard Drawing 941-1.

941.2 EMBANKMENT CONSTRUCTION

.1 In embankment construction the Engineer will supply stakes for toe of Slope and Subgrade centreline and Shoulder elevations.

.2 The Contractor shall supply all other stakes, marks and grades necessary to maintain the specified Foreslope up to Subgrade.

941.3 HIGHWAY CUTS

.1 The Engineer shall supply stakes for the Subgrade centreline and Shoulders, back of ditch and the top of Backslope.

.2 The Engineer shall provide for the Contractor's use, offset stakes on each side of the alignment with grades indicated for the Shoulder (on front) and the back of ditch (on back).

941.4 DEEP FILLS OR CUTS

.1 The Engineer shall set intermediate stakes at approximately every 3 metres of change in elevation as a check on the inclination of the Slopes excavated or constructed at the point of measurement and staking.

.2 These stakes shall be set as follows:

  .1 cuts: a back of ditch stake will be set to ensure that the Backslope is not overexcavated at the point of measurement.

  .2 fills: a stake will be set in such a location as to be representative of the elevation of the lift of fill being placed and at the extreme edge boundary of the standard lift so as to ensure that the Foreslope is maintaining the specified line and grade.

941.5 STRUCTURES

.1 The Engineer will provide pile layout, centreline of Roadway, centreline of bearings, and building line or working points as designated on the Plans for each major component of the Structure.

  .1 The Contractor shall reference and maintain these marks and carry out additional layout as required.

.2 The Engineer will provide benchmarks for grades which will be transferred to the concrete as construction progresses.

.3 The Engineer will provide layout for foundation excavation, approach Roadway cuts and fills, and other Contract Items in accordance with this Item.

941.6 TOLERANCES

.1 The graded surface of material placed shall be checked with a 3 m straight edge, by stringline method or other method approved by the Engineer and shall be conducted at selected locations in the presence of the Engineer.

.2 This measurement shall be taken along the centreline and Shoulder of the Work, as well as at cross Slope locations.

.3 Areas which are determined to be outside the specified tolerances will be spray painted directly on the ground with the words "cut or fill", whichever is applicable.

.4 For Aggregate Base/Subbase checking shall be conducted by stringlining on a random basis.

  .1 The criterion for acceptable placement shall be that 90% or greater of the results, based on a minimum sample size of 20 locations, shall be equal to or within the specified tolerances.

  .2 Should the results of 941.5.4.1 be outside the tolerances specified, then the Contractor shall repair the Work to meet the specified tolerances and shall conduct a new stringline survey of the Work as per 941.5, at his own expense.

.5 For fine grading, checking shall be performed by stringlining between every stake location.

  .1 Fine grading of Shoulders or other restricted or narrow areas to be paved shall be carried out to the grades, slopes, dimensions and tolerances as directed by the Engineer.

.6 The Contractor shall meet the design lines and grades within the tolerances as shown in Table 941-1. The variance at any point checked to any other point shall not exceed the stated tolerance.

.7 The location of the checking shall be longitudinally from centreline point to centreline point, from Shoulder point to Shoulder point and based on the specified material and reference distance specified in Table 941-1.

.8 The location of the checking transversely shall be from the centreline point toward the Shoulder at the same location point as defined in 941.5.6 and based on the specified material and reference distance specified in Table 941-1.

.9 The location of the checking diagonally, when requested, shall be from the centreline point toward the Shoulder at the next location point as defined by the reference distance, based on the specified material, specified in Table 941-1.

.10 All lines and grades intermediate to the points of measurement shall be such that a smooth and continuous transition for any one point to another shall exist and shall be within the prescribed tolerances over the entire reference distance length.

941.6 .11 The finished surface at any place shall not deviate from the lines and grades specified in the Contract Documents by more than the tolerances specified in Table 941-1.

.12 All humps or depressions exceeding the specified tolerances shall be corrected by the Contractor by reshaping or removing the defective area(s) and/or replacing the area with new material as required.

.13 When the material is to be placed adjacent to a Pavement the finished surface elevation shall be referenced to the edge of Pavement.

.14 The Contractor shall be responsible to maintain the lines and grades of the Roadway surface until such time as the Work is accepted by the Engineer or the area is paved.

Table 941-1
Grade Tolerances

Surface Being Graded	Material Type	Tolerance
Subgrade or undercut	rock (except friable rock)	+75 mm/–50 mm
Subgrade or undercut	friable rock (sandstone, shale,etc.)	50 mm
Subgrade or undercut	soils	30 mm
Aggregate Subbase (top lift)	Aggregate Subbase	25 mm
Aggregate Base (placement)	Aggregate Base	20 mm
Aggregate Base (fine grading)	Aggregate Base	12 mm

Note: Grade stakes shall be placed at stations (longitudinal reference distances) of 25 m spacing, except for fine grading, for which the stations shall be at 12.5 m spacing.

Undercut means the surface at the specified depth below Subgrade in a cut or fill.

946.1 DESCRIPTION

.1 This Item describes the procedures and timeframes the Contractor shall follow to ensure effective protection of the environment and orderly progression of the excavation and embankment Work in erodible (erosion-prone) materials, by performing the Work diligently and in accordance with approved Work Schedule(s) submitted per Item 906.

.2 Erodible materials typically include cohesive and organic soils handled under Item 106, 107 or 121; mudstone or similar types of rock handled under Item 107, 108 or 121; and topsoil handled under Item 106, 107 or 613.

946.2 WORK AREAS

.1 For the purposes of this Item, a Work Area is an area of the Work Site having limits that, notwithstanding 946.3.3, are based on the premise of completing and stabilizing erosion-prone cuts and fills therein no later than 30 days after beginning them. Work Areas may vary in size, as follows:

  .1 A Work Area may encompass several small cuts and fills if they all can be completed within the 30-day period; or

  .2 A Work Area may be part or all of a large cut and fill; one large cut that satisfies several fills; or one large fill requiring material from several cuts and/or borrow to complete. For each such large Work Area in which the cut/fill Work is not able to be completed within 30 days, 946.3.3 applies.

.2 The extent of each Work Area (station limits, estimated quantities and duration of cut/fill Work therein) shall be submitted in writing before Work under Item 102, 106, 107, 108 or 121 begins, or shall be as indicated on the approved initial and subsequent Work schedules.

.3 The Contractor may work on more than one Work Area at a time, but each Work Area shall have its own 30-day period.

.4 The 30-Day period shall begin the day that stripping/cut/fill construction begins, or one week from commencement of grubbing, whichever is sooner.

946.3 STABILIZATION

.1 Stabilization shall mean hydroseeding of all erodible materials, or, when the Engineer deems it is not practicable to do hydroseeding, mulching of such materials.

.2 For Work Areas that can be completed within the 30-day period, all ditches, slopes and other exposed areas shall be acceptably shaped, topsoiled where specified, and hydroseeded under Item 614.

  .1 Such Work Areas shall be mulched under Item 616 if the 30-day period extends beyond the cut-off date for hydroseeding per 614.4.8.5. Placement of topsoil in such cases will be at the discretion of the Engineer.

946.3 .3 Work Areas that cannot be completed within the 30-day period because cut/fill quantities are too large (per 946.2.1.2), or because of prolonged wet weather, shall have all erodible materials mulched under Item 616.

.4 Stabilization is not required on the top surface of a fill, on the floor of a cut, or on the part of a cut anticipated to be excavated within one week after the 30th day.

.5 Stockpiles, including topsoil piles, shall be mulched under Item 616.

946.4 UNCOMPLETED WORK AREAS

.1 Work Areas that have been under continuous and diligent construction but are not completed by the end of the 30-day period shall be stabilized per 946.3.3. Work shall continue diligently on the cuts and fills, which shall be stabilized each successive 30-day period until final shaping and hydroseeding are completed.

.2 Grubbed and stripped Work Areas that have not been under continuous and/or diligent construction, or that have been abandoned with cuts/fills uncompleted, and which present the potential for fines to be washed into a watercourse, shall be mulched per 616.2 and 616.4 at the Contractor's expense by the end of the 30-Day period or by the 7th Day after abandonment, whichever is sooner.

  .1 Abandonment shall mean ceasing construction on the cuts and fills in a Work Area without valid cause. Valid cause would include prolonged wet weather, unworkable site conditions due to precipitation, or an order by the Engineer or officials from DFO, DELG or other regulatory agency to cease Work for reasons not attributable to the Contractor's actions or failure to act.

.3 Work Areas that are not completed at the time of winter shutdown shall be mulched under Item 616, except that any exposed areas the Contractor failed to mulch under a previous 30-day period shall be mulched per 616.2 and 616.4 at the Contractor's expense.

946.5 OTHER

.1 Erosion-prone embankments constructed within 50 m of natural watercourses shall be stabilized in accordance with Item 948 and as elsewhere specified in the Contract Documents.

.2 Erosion-prone cuts shall be excavated such that runoff is directed to one or two exit points and controlled by Sediment Control Fence and/or Erosion Control Structures per Item 602 and Item 605, respectively.

.3 Areas that have been acceptably shaped but are damaged by precipitation, runoff or slope failure before hydroseeding has been done, shall be acceptably repaired and reshaped at the Contractor's expense and then hydroseeded under Item 614.

946.5 .4 Areas that have been acceptably shaped and hydroseeded, but are subsequently damaged by precipitation, runoff or slope failure, shall be repaired, reshaped under the provisions of Item 812 and hydroseeded under Item 614.

.5 If stabilization of erodible materials has not been performed by the 30th day as described in this Item, the Contractor shall pay to the Owner a penalty of $500.00 for each day (except Sundays and statutory holidays) that the required Work remains uncompleted, beginning on the third day following the end of the 30-Day period or the 10th Day after abandonment, whichever is sooner.

.6 Rock cuts shall be subject to the Work Area and 30-day requirements of 946.2 unless the Engineer agrees that some of the in situ rock and/or blasted but unexcavated rock may be left in place for use at a later date. The stabilization requirements of 946.3 do not apply unless the rock cut foreslopes and ditches are to be topsoiled.

  .1 Rock fills shall be subject to the Work Area and 30-day requirements of 946.2, including stabilization if the slopes are to be topsoiled.

947.1 DESCRIPTION

.1 Disposal areas are for the disposal of waste from clearing, grubbing and/or excavation and for all other surplus excavation materials not identified for stockpiling.

.2 In cases where soil or rock is suspected of being contaminated, the Contractor shall call the Stewardship Branch of ELG at (506) 453-7945 for advice.

.3 For disposal of known contaminated soil or rock and construction or demolition waste produced during the Work, the Contractor shall apply to ELG for an "Approval To Operate".

.4 Disposal areas shall be located outside the Right-of-Way or as specified in the Contract Documents, where the materials placed in them shall not block or impede natural drainage and shall not be within 30 metres of any watercourse or be allowed to cause siltation of any watercourse.

.5 Contractors shall be responsible to obtain permission from property owners to use their land as disposal areas, and are responsible for all costs thereof.

  .1 If the Contractor places a disposal area on private property, the Owner shall in no way be responsible for any damages to septic tanks, wells, ornamental trees or shrubs, driveways, lawns, buildings or any other part of the property, whether such damage is alleged or proven to have been caused by placement of the disposal area material.

  .2 The Contractor shall be responsible for all costs associated with the supply, maintenance and rehabilitation of disposal areas.

    .1 Stabilization of disposal areas shall be carried out in accordance with 947.1.8.

.6 Disposal areas shall be cleared of all Merchantable Timber in accordance with 101.1, 101.3 and 101.4, prior to the placement of any waste.

.7 The minimum distance between the entrances of two disposal areas on the same side of the Highway shall be 150 metres unless specifically altered by the Engineer, in writing.

.8 Entrances to disposal areas shall be at right angles to the centreline of two-way Highways and at an angle opposing the flow of traffic on divided Highways.

.9 Entrances shall not exceed 10 metres in opening width and shall extend back along a line perpendicular to, or at the angle defined in 947.1.6, from the Right-of-Way for a minimum distance of 15 metres. All materials being pushed or otherwise deposited in the disposal area shall be placed at least 15 metres beyond the Right-of Way, i.e. beyond the entrance. Boulders and other debris shall not be left in the disposal area entrance.

.10 Disposal areas shall be left in a neat and finished appearance, and shall be hydroseeded, mulched or otherwise stabilized against erosion, obtaining guidance from the described work progression details as noted in Item 946 and to the satisfaction of the Engineer. Windrows of earth or debris on either side of the entrance shall be either removed or shaped to a uniform and level condition.

948.1 DESCRIPTION

.1 The Contractor shall carry out the Work on the Contract according to the Plans and Specifications and in such a manner so as to be in compliance with various Acts and Regulations of the Province of New Brunswick and/or the Government of Canada which concern the protection of the environment, and any approvals or permits issued to the Owner or the Contractor in accordance therewith.

.2 Measures determined by the appropriate regulatory authorities as necessary for the protection of watercourses affected directly or indirectly by the Work will be detailed, to the degree practical and not necessarily all inclusive, on the Plans and in the Specifications under the appropriate bid Items.

.3 Environmental protection measures shall be installed whenever possible prior to the commencement of the Work.

  .1 If not possible to provide the environmental protection prior to the commencement of the Work, the Contractor shall as a minimum have all materials required for the environmental protection available on site prior to the commencement of any Work and shall install the environmental measures as soon as practical in the Work progression.

.4 If any suspected artifacts of historical or archaeological value are uncovered or any endangered plant or animal species or any contaminated soil(s) are identified during the Work, the Contractor shall cease Work until the site has been reviewed by representatives of the appropriate agencies and the Engineer has approved resumption of the Work.

  .1 GC(18) shall apply.

.5 The Contractor shall follow sound environmental construction practices.

  .1 Guidance to the Contractor in applying these practices to his Work shall be derived from, but is not limited to, the following DOT publications:

- Environmental Protection Plan
- Environmental Field Guide

948.2 CONDITIONS OF APPROVAL

.1 The Contractor shall complete the Work in accordance with the measures identified in 948.1.2 and the following conditions :

  .1 Sediment and erosion control measures shall be carried out as detailed on the Plans and included in the Specifications.

948.2.1 .2 Debris and excavated material within the Work Area shall be removed from the watercourse and adjacent areas for disposal or placement in a manner such that it cannot be returned to the watercourse.

.3 Precautions shall be taken by the Contractor to prevent discharge or loss of any harmful material into a watercourse including but not limited to creosote, hydrocarbons, biocides, fertilizers, cement, lime, paint or fresh concrete.

.4 Machinery and pollutants shall be located or stored in areas not in danger of floodwaters.

.5 No grubbing, excavation, embankment construction or installation of drainage Structures shall take place within the buffer zones on both sides of each natural watercourse, as indicated in the Contract Documents, until the appropriate sediment control fence and erosion control structures are installed, in order to ensure that run-off, by the time it reaches a watercourse, does not have a suspended solids level in excess of 25 mg/L or other level approved by ELG.

  .1 Installation and maintenance of these structures shall be in accordance with Item 602 and Item 605 respectively.

.6 Within a buffer zone, any temporary Work Area access roads, haul roads and/or areas constructed for the installation of a drainage Structure, shall be surfaced with at least 100 mm of clean gravel or rock placed the same day they are built, to provide sufficient cover to the soil exposed so as to provide environmental protection to the watercourse from runoff.

.7 No blasting shall take place in or near a watercourse without prior written consent from the federal DFO.

.8 In dewatering an excavation, whether a Roadway cut, foundation excavation, a pit or a quarry, the Contractor shall ensure that any turbid water pumped out or released has a suspended solids level, by the time it reaches a watercourse, of no more than 25 mg/L or other level approved by ELG.

  .1 Erosion control measures required to achieve this level of compliance when dewatering is conducted for Roadway and foundation excavations shall be constructed in accordance with and measured for payment under the appropriate Item(s) pertaining to the Work.

  .2 It shall be the Contractor's responsibility to install and maintain, at his own expense, to the satisfaction of ELG any erosion control measures for pits and quarries that may be required, and to obtain permission to pump or release any turbid water onto properties abutting and beyond.

  .3 The Contractor shall be responsible, at his own expense, for any and all damage resulting from the dewatering.

948.2.1 .9 Earth fill slopes over natural watercourses, for a distance of 25 m on each side of the culvert or a distance as indicated in the Contract Documents, shall have each Days' embankment construction stabilized, as follows:

.1 Soils with more than 25% Dust, excavated rock or Random Riprap shall be placed over geotextile to the Subgrade Shoulder or four metres above the pipe invert, whichever is less. Above four metres height, such fill slopes shall be hay mulched. Measurement for payment will be made in accordance with Item 601, Item 608 and Item 616, as applicable.

.2 Soils with less than 25% Dust, mulch shall be placed on the slope up to the Subgrade Shoulder in accordance with Item 616.

.3 In both cases the mulching of fill slopes outside the specified width shall be carried out for every four metres of fill height, and upon completion of the fill the slope (except riprapped areas) shall be final shaped and hydroseeded. Measurement for payment will be made in accordance with Item 616 and Item 614, as applicable.

.10 The Contractor shall not place an earth or rock causeway in the watercourse for the purpose of creating a temporary access Structure, without specific approval of the Engineer and the appropriate regulatory authority(ies), in writing.

.11 Instream Work shall be carried out between June 1st and September 30th. The Contractor shall notify the Engineer, in writing, at least 7 Days in advance of the anticipated date of commencement of instream Work.

.12 Water control for all Culvert installations in natural watercourses, other than those for which a site-specific method and/or sequence is indicated in the Plans, shall be accomplished using one of the following methods:

.1 Installing the new Culvert in the dry and diverting the watercourse through it upon completion;

.2 Constructing a temporary plastic-lined diversion channel in the dry; or

.3 Stemming the flow upstream and pumping the flow around the Work Area, ensuring the pump runs whenever there is sufficient water, and having the discharge back into the stream immediately below the Work Area.

.13 If it is necessary to isolate the stream from the Work Area, the Contractor shall construct cofferdams consisting of, as a minimum, a layer of 6-mil clear polyethylene sandwiched between an outer (stream-side) wall of sandbags and an inner wall of earth fill.

.14 The Engineer, upon receiving notice from the Contractor as to when construction shall actually commence, will arrange an on-site meeting with representatives from ELG, DFO and the Contractor, prior to commencement of the instream Work.

948.2.1.14 .1 No Work shall commence until the Engineer verifies with the regulatory agencies having jurisdiction, that the Work Site is approved for the commencement of instream Work.

.15 Earthwork shall be carried out in accordance with Item 946. Erosion control measures shall be as detailed in the Contract Documents and if additional measures are required in addition to those indicated, the Engineer shall order and approve such Work under the appropriate Items.

.16 Natural materials produced and/or supplied by excavation or from pits and quarries shall not contain any friable, soluble or reactive minerals or other deleterious materials or conditions that would make the material prone to decomposition or disintegration, or present any environmental hazard, from the presence of the parent material or its by-products, when exposed to the natural elements after placement in the Work.

.17 Additional conditions of approval as detailed in the Contract Documents, shall be carried out by the Contractor.

.18 A copy of the Watercourse Alteration Permit shall be kept on the Work Site for the duration of the Contract, and shall be made available upon request of an inspector designated to act on behalf of ELG or an employee of DFO.

948.3 COMPLIANCE AND DELAYS

.1 Failure by the Contractor to carry out the Work in accordance with the requirements of this Item will result in the Contractor being liable for any fines, levies or penalties made under environment-related Acts or Regulations of the Province of New Brunswick and the Government of Canada, and may result in suspension of Work, under GC(18), until the Contractor commences the Work as specified and/or takes remedial measures to repair or compensate for any environmental damage resulting from his inaction or improper actions in carrying out the Work.

.2 Delays to the Contractor's Work operation resulting from suspension of Work for failure to follow the requirements of this Item will not be considered as a basis of claim for extra costs, nor for any extension of the Contract Completion Date.

948.4 POLLUTION CONTROL

.1 The Contractor shall not dump, spill or dispose of any Overburden, trees, brush, petroleum products, camp refuse or other debris into any watercourse, reservoir, or other natural water basin, or into any area which may ultimately cause pollution to water drainage or storage systems and/or groundwater.

.2 It shall be the Contractor's responsibility to familiarize himself with the applicable legislation and regulations and to obtain all necessary permits and approvals for his operations.

948.5 WATER AND RUNOFF CONTROL

.1 The Contractor shall perform his Work in a manner so as to not obstruct the flow of surface drainage or natural watercourses.

.2 The Contractor shall dispose of water resulting from the Work in a manner not detrimental to public and private property, or any portion of the Work completed or under construction.

  .1 The Contractor shall comply with all requirements of ELG, Municipal codes or other regulatory agencies having jurisdiction regarding the disposal of water from excavations.

948.6 RELEASE OF FUEL AND OTHER HAZARDOUS SUBSTANCES

.1 The Contractor, including any subcontractors and/or any agent(s) of the Contractor involved in any aspect of the Contract, shall be responsible for all containment and cleanup of any release of fuel and/or other hazardous materials, regardless of the cause of the release.

  .1 This shall apply to the Work Site, all lands being used by the Contractor and under the control of the Owner, and/or any Crown Land being utilized for the Work under the Contract.

951.1 CLEAN PREMISES

.1 During the course of the Work the Contractor shall keep the Work Area in a neat and tidy condition satisfactory to the Engineer.

.2 The Contractor shall upon the completion of the Work, remove all temporary Structures and clear away all rubbish, surplus and waste material remaining on or about the Work Site and leave the premises in a neat and tidy condition satisfactory to the Engineer.

  .1 If these requirements are not met, the Engineer may give written notice to the Contractor requiring him to remedy the situation.

  .2 If the Contractor fails to remedy the situation within 14 Days of receipt of the notice, the Engineer may cause the situation to be remedied and may deduct the cost thereof from any money owing to the Contractor.

951.2 DAMAGE TO WORK

.1 The Work shall be at the risk of the Contractor and he shall bear all loss or damage arising from any cause, which may occur to the Work until the Work is accepted by the Owner.

.2 If any such loss or damage occurs before the final acceptance, the Contractor shall immediately repair, restore and re-execute the lost or damaged Work, so that the Work, or the portions thereof, shall be completed within the specified time.

952.1 GENERAL

.1 The Contractor shall observe construction safety measures as referenced in but not limited to, the National Building Code, the provincial regulations pertaining to workplace safety and/or any municipal or local regulations having authority provided that in any case of conflict or discrepancy the more stringent requirements shall apply.

.2 The Contractor shall Work specifically in reference to CAN/CSA S269.1 and CAN/CSA S269.2.

.3 The Contractor shall ensure at all times that no part of the Work shall be subjected to loading that will cause permanent deformation.

952.2 PLATFORMS

.1 Construction safety platforms shall be provided by the Contractor at the locations indicated in the Contract Documents.

.2 The Contractor shall be responsible for the design and the construction of the platforms in accordance with Item 956.

.3 Safety platforms shall be designed and constructed to provide a continuous and unbroken working surface at the level of the girder bottom flange.

.4 Construction platforms shall be adequately fastened and secured to prevent accidental displacement.

.5 All workers employed in the installation or removal of slab overhang brackets or any other construction activity on or outside of the spandrel girders shall be properly secured to static safety lines at all times.

952.3 SAFETY NET SUPPORT SYSTEM

.1 A safety net support system shall be provided by the Contractor at the locations indicated in the Contract Documents.

.2 In order to provide support for safety nets, the Contractor shall supply all materials and construct the support system for safety net lines as indicated on the Standard Drawings 952-1 and 952-2.

  .1 The anchor assemblies shall be made available by the Owner from stock at DOT Fredericton, NB.

952.3 .3 Where the Contractor chooses to employ safety nets as a means to satisfy the safety requirements for his Work;

.1 The Contractor shall supply and install the HP310x132 steel sections, the 10 tonne clevises and the 16 mm steel cable indicated on the Standard Drawings 952-1 and 952-2.

.2 All structural steel fabrication shall conform to CAN/CSA S6 and S16.1.

.3 The safety net support system and the safety nets must be in place before the deck slab and the diaphragm forming shall commence.

.4 Once the safety net system is no longer required in the Work, the Contractor shall remove the net, cables, clevises and the HP310x132 steel sections.

.1 With the exception of the anchor bolts, all removable portions of the safety net system shall remain the property of the Contractor.

.2 The anchor bolts shall be installed in the anchor bolt assembly and shall remain in place at the end of the Work.

.5 Where the Contractor chooses to employ a system other than safety nets as a means to satisfy the safety requirements for his Work, the anchor bolts shall be installed in the anchor bolt assembly and shall remain in place at the end of the Work.

CONSTRUCTION DRAWINGS AND CALCULATIONS

ITEM: 956

956.1 GENERAL

.1 The Contractor shall supply the Engineer with drawings and design calculations for items including, but not limited to, the following:

  .1 Bridge bearings
  .2 Bridge expansion joints
  .3 Cofferdam including bracing
  .4 Removal of Obsolete Bridge Structures
  .5 Falsework
  .6 Formwork
  .7 Shop Drawings of all metalwork
  .8 Shop Drawings for prestressed concrete beams
  .9 Shoring
  .10 Temporary detour Structures
  .11 Filter Screen
  .12 Shop Drawings for Culverts per 130.3, 131.3, 140.3, 141.3, and 142.3

.2 Six copies of the drawings and two copies of the design calculations, stamped and signed by a Professional Engineer registered or licensed to practise in the Province of New Brunswick, shall be submitted to the Engineer at least 14 Days in advance of the scheduled construction, demolition and/or fabrication of any of, but not exclusively limited to, the above-listed items.

  .1 The Engineer will, in writing to the Contractor, acknowledge receipt of drawings and design calculations.

.3 Drawings and design calculations shall be specific to the project for which they are submitted.

.4 The Contractor shall review all shop drawings prior to submission to the Engineer.

  .1 The Contractor represents by this review that: (1) the Contractor has determined and verified all field measurements and field construction conditions, or will do so; (2) the product requirements, catalogue numbers and similar data meet or exceed the specified requirements; and (3) that the Contractor has checked and co-ordinated each shop drawing with the requirements of the Work and the Contract Documents.

  .2 The Contractor shall confirm this review of each shop drawing by date, and signature of the person responsible.

  .3 At the time of submission, the Contractor shall notify the Engineer in writing of any deviations in the shop drawings from the requirements of the Contract Documents.

.5 No fabrication and/or construction shall commence on any aspect of the Work for which drawings and design calculations are required until drawings are received and returned by the Engineer, as per 956.1.2, 956.1.3 and 956.1.4 unless approved otherwise by the Engineer.

956.1 .6 In addition to the above noted drawings, Contractors supplying precast prestressed concrete beams shall supply the Engineer with two sets of beam layout drawings.

.7 The Contractor shall not be relieved of responsibility for results obtained by the use of these drawings.

  .1 The Owner makes no commitment to review the submitted shop drawings or calculations for conformance to the Contract Documents, either in part or in whole.

  .2 Identification of any discrepancies from the requirements of the Contract Documents does not imply that the Owner is providing a comprehensive identification of such discrepancies.

.8 Drawings shall show clearly the size and spacing of all members and their connections as well as the grades and/or species of all materials.

.9 Welding done on any of the above items shall conform to the requirements of CSA W59.

  .1 Welding within the Province of New Brunswick shall be performed by a welder holding a valid Qualified Welder's Certificate issued by the Province of New Brunswick or by a welder certified in accordance with CSA W59.

  .2 Welding outside the Province of New Brunswick shall be performed by a welder certified in accordance with CSA W59.

  .3 Welding to the permanent Structure shall only be carried out if specifically indicated in the Contract Documents or authorized, in writing, by the Engineer.

.10 The provisions defined under 956.2.6, 956.2.7 and 956.2.8 relating to the Owner's soils information are also applicable to 956.1.1.

.11 Drawings bearing the seal and signature of a Professional Engineer, as defined under 956.1.2, and being those submitted and received by the Engineer, shall be made available at the site, by the Contractor, prior to the commencement of the Work detailed, and shall be maintained at the site until the completion of the Work.

956.2 TEMPORARY ACCESS STRUCTURES

.1 The Contractor's drawings for temporary access Structures shall be prepared by a Professional Engineer registered or licensed to practise in the Province of New Brunswick.

.2 The Contractor shall notify the Engineer in writing of the name and licence or registration number of the Professional Engineer(s) who will be responsible for the design and construction of the Work, at least one month in advance of the construction of the temporary access structure.

.3 The Contractor shall submit drawings, upon request, for temporary access Structures.

956.2 .4 The Contractor shall have the sole responsibility for the design, erection, operation, maintenance, and removal of temporary supports, Structures, and facilities and the design and execution of construction methods required in their use.

.5 The Contractor shall also be responsible to the Owner to make good any damage which befalls any property of the Owner due to the design, construction, maintenance, suitability and/or adequacy of any temporary access structure.

.6 The Contractor shall be permitted access to the Owner's soil boring data and any applicable further soils studies or reports which may have been prepared by the Owner or its consultants on the express understanding that these data and information have been prepared and used by the Owner in connection with the design of the permanent Structure(s) only, and for no other purpose.

  .1 The data and information may not be applicable to the precise locations where the Contractor may erect temporary access Structures, and the Contractor shall be solely responsible for obtaining any further data and information which he may require for his purposes.

  .2 The Contractor hereby waives any claim he may have against the Owner with respect to the suitability, adequacy and/or accuracy for the purposes of the Contractor of any soil boring data, studies, reports, or other information available from the Owner and used by the Contractor.

  .3 The use of the Owner's soil boring data and information by the Contractor, shall in no way diminish or derogate in any way from the responsibilities of the Contractor noted in 956.2.3, 956.2.4 and 956.2.5.

  .4 Item 926 shall apply to the Work.

.7 Any subsurface information available is based on the investigation made at the specific locations indicated. The Owner makes no guarantees, representations, warranties, either expressed or implied, with respect to any such information, and further cautions the Bidder/Contractor that these conditions are not necessarily typical and may have changed since the field data were collected.

.8 The Owner further makes no guarantees, representations or warranties, either expressed or implied, that the presence or absence of water on the site and any subsurface explorations when made, will be representative of the actual conditions at the time of construction.

.9 The Contractor, prior to the loading of the temporary access Structures, shall provide to the Engineer written certification signed by the designated Professional Engineer, identified in 956.2.2, that:

  .1 the structure has been constructed in accordance with the Contractor's Plans,

  .2 the structure has been constructed of sound materials consistent with the design parameters, and

  .3 the structure is ready to support the loads for which it was designed.

956.3 DESIGN REQUIREMENTS

.1 Structural members incorporated into temporary detour Structures shall be designed to meet the requirements of CSA S6.

.2 Timber, lumber and timber piles incorporated into temporary works other than temporary detour Structures shall be designed to meet the requirements of CSA S269.1.

  .1 Where timber and lumber do not bear a valid and legible grading stamp, permissible design stresses for Joint and Plank Grades shall not exceed those permitted for S-P-F Grade No. 2.

  .2 Where timber and lumber do not bear a valid and legible grading stamp, permissible design stresses for Beam and Stringer Grades shall not exceed those permitted for S-P-F Grade No. 1.

.3 Structural steel members incorporated into temporary works other than temporary detour Structures may be designed to meet the requirements of one of the following:

  .1 CSA S16 for members subject to static loads;

  .2 CSA Standard S16 for moving loads, such as cranes, trucks, etc. provided an impact allowance of 30% on live loading is used and the distribution of wheel loads to stringers and floor beams is as specified in CSA S6; or

  .3 CSA S6.

.4 Temporary concrete footings or piers supporting falsework or other such elements shall be designed to meet the requirements of CSA S6 or ACI Standard 318.

956.4 GRADING and MATERIAL REQUIREMENTS

.1 Timber and lumber used in the construction of falsework, formwork, shall be graded and stamped with the grade mark used by the Canadian Lumber Manufacturing Association and Agencies authorized to mark lumber in Canada and/or lumber approved by the Engineer.

.2 Timber piles used in the falsework shall meet the requirements of CSA 056.

.3 Structural steel shall meet the requirements of ASTM A36 or CSA G40.21M Grade 260W.

  .1 Steel shall be free of kinks and bends and shall have no welds across the tension flanges.

  .2 Steel members with reduced cross-sectional areas, due to holes, cuts, which reduces the design capacity of the members shall not be used.

956.4.3 .3 Where the grade of the steel members is not specified, the Engineer will assume that the yield point of the steel is 200 MPa.

956.5 PROPRIETARY SHORING, FORMS AND ACCESSORIES

.1 At the time of the construction drawing submission, the manufacturer's technical literature presenting allowable loads, shall be submitted for any proprietary element or component proposed to be incorporated into the Work.

957.1 GENERAL

.1 The Contractor shall be responsible for all falsework design and construction and shall carry out the Work in accordance with Item 956.

.2 The Contractor shall furnish, construct, erect, maintain and subsequently remove and dispose of all falsework required for the erection of the Work.

- .1 The Contractor shall have total control of the Work and shall effectively direct and supervise the Work so as to ensure Conformity with the falsework requirements.

- .2 The Contractor shall be solely responsible for the design, construction means, methods, techniques, sequences, and procedures and for co-ordinating the various parts of the Work.

.3 Falsework shall include all temporary supports and foundations and shall be properly designed and substantially constructed and maintained to sustain the loads which will come upon it.

.4 The Contractor shall certify that no permanent stresses or other detrimental effects on the completed Structure result from the falsework design.

.5 The Contractor shall carry out the Work such that no permanent stresses or other detrimental effects on the completed Structure result from the falsework.

.6 Falsework design shall be in conformance with CAN/CSA S269.1 and as specified herein.

.7 The following conditions are the minimum requirements for all falsework design and construction.

- .1 Falsework shall be designed and constructed to provide the necessary rigidity and to support dead, live, wind and stability loads.

- .2 Bracing required to maintain the rigidity of the falsework under all loading conditions shall be shown clearly on all drawings.

- .3 Connection points of bracing members shall be designed to develop the strength required by the computed design load but not less than 50% of the effective strength of the members.

- .4 Timber cap beams shall be connected to timber piles by drift pins or equivalent.

- .5 The minimum size of bolts used in the connection points of bracing members shall be 19.0 mm in diameter.

- .6 Falsework for support of the Superstructure shall be designed and constructed to support loads that would be imposed were the entire Superstructure (except portions above the deck slab) placed at one time.

- .7 Falsework shall be constructed to produce a finished Structure true to the lines and grades as indicated in the Contract Documents.

957.1.7 .8 The falsework drawings shall clearly show the amount of calculated deflection of bending members under total dead loads.

.9 Suitable methods shall be used to set the forms to the required grade or camber and to take up any settlement in the falsework which may occur before or during placement and until initial set of the concrete has been achieved.

.10 Anticipated total settlements of falsework and forms shall be indicated by the Contractor on the falsework drawings.

  .1 These shall include falsework footing settlement and joint take-up.

  .2 Anticipated settlements over 15 mm will not be allowed unless otherwise permitted by the Engineer.

    .1 Deck slab forms between girders shall be constructed with no allowance for settlement relative to the girders.

957.2 PILES AND FOUNDATIONS

.1 Falsework shall be founded on solid rock or supported on driven timber or steel piles.

.2 Mudsills shall only be permitted if approved, in writing, by the Engineer.

  .1 Mudsills shall only be supported on a compacted foundation grade.

  .2 The soil bearing pressure under mudsills shall not exceed 150 kPa, however the Contractor may submit an alternate bearing pressure value supported by engineering analysis and based on soil design parameters determined by field testing methods, subject to the approval of the Engineer.

  .3 Soil bearing pressure shall be uniformly distributed over the entire mudsill area.

.3 Piles shall be driven to the bearing capacity as submitted in the falsework design.

  .1 The Contractor shall provide verification of the capacity to the Engineer. The maximum calculated service load on a timber pile shall not exceed 225 kN.

.4 When steel scaffolding type falsework is used by the Contractor, the base plates on all jack screws shall provide full and even force against mudsills and ledger beams.

957.3 REMOVAL

.1 The release and/or removal of temporary supports, bracing, temporary members and guys must be carried out in a staged manner and under no circumstances will a sudden release of support be permissible.

.2 Falsework shall not be removed until the compressive strength of the last placed concrete, including concrete above the Bridge deck reaches 80% of the specified 28-day compressive strength.

.3 Falsework supporting a continuous or rigid frame structure shall not be removed from any span until the concrete in all the spans of the continuous unit has reached 80% of the specified 28-day compressive strength.

.4 Falsework shall be removed uniformly and gradually beginning at the centre of the span and working towards the supports.

.5 Falsework for cast-in-place prestressed portions of Structures shall not be released until after the prestressing steel has been tensioned.

.6 Falsework piling shall be removed.

  .1 Falsework piling for the support of Structures over land shall be removed to a minimum of 600 mm below the surface of the original ground or the finished Slopes, whichever is lower.

957.4 FALSEWORK CERTIFICATION

.1 The Contractor shall provide, prior to the placement of concrete or the application of any loading, certification by either a Professional Engineer registered or licensed to practice in the Province of New Brunswick or a person designated by a Professional Engineer, in writing and bearing the seal and signature of a Professional Engineer, to be competent to certify that the falsework has been constructed:

  .1 in accordance with the falsework design submitted in accordance with 957.1.6 and 957.1.7, and

  .2 of sound materials consistent with the design parameters.

958.1 GENERAL

.1 The Contractor shall be responsible for all formwork design and construction and shall carry out the Work in accordance with Item 956.

.2 The Contractor shall furnish, construct, erect, maintain and subsequently remove and dispose of all formwork required for the erection of the Work.

  .1 The Contractor shall have total control of the Work and shall effectively direct and supervise the Work so as to ensure Conformity with the formwork requirements.

  .2 The Contractor shall be solely responsible for the design, construction means, methods, techniques, sequences, and procedures and for co-ordinating the various parts of the Work.

.3 The Contractor shall certify that no permanent stresses or other detrimental effects on the completed Structure result from the formwork design.

.4 The Contractor shall carry out the Work such that no permanent stresses or other detrimental effects on the completed Structure result from the formwork.

  .1 The Contractor shall not weld any form hangers, chairs, bar supports, etc. to the flanges or webs of steel girders.

.5 Formwork design shall be in conformance with CAN/CSA S269.3 and as specified herein.

.6 The following conditions are the minimum requirement for all formwork design and construction.

  .1 Formwork shall be designed and constructed to provide the necessary rigidity and to support all dead and live loads.

  .2 Bracing required to maintain the rigidity of the formwork under all loading conditions shall be clearly shown on the formwork drawings.

  .3 Fluid pressure as lateral thrust on vertical forms shall be correlated to the capacity and type of placing Equipment, the planned rate of placing concrete and the slump and temperature of the concrete.

  .4 In no case, shall wall forms, over 1200 mm in height, be designed for less than 1200 mm fluid head of concrete and in no case shall column forms over 2000 mm in height be designed for less than a 2000 mm head.

  .5 Forms for exposed concrete surfaces shall be designed and constructed so that the formed surface of the concrete does not undulate excessively in any direction between studs, joints, form stiffeners, form fasteners or wales.

    .1 Undulations shall not exceed 1/270 of the center to center distance between studs, joists, form fasteners, form stiffeners or wales, or 2 mm, whichever is smaller.

958.1.6.5 .2 Should any form or forming system, even though previously approved for use, produce a concrete surface with excessive undulations, its use shall be discontinued until modifications, satisfactory to the Engineer have been made.

.6 On steel girder structures, timber or steel posts shall be used at each overhang bracket to distribute the load to the top and bottom flanges as detailed on Standard Drawing 958-1.

958.2 FORMS

.1 Forms shall be smooth, mortar-tight, true to the required lines and grades and of sufficient strength to resist springing out of shape during placing of concrete.

.2 Materials to be used for forms shall be thoroughly cleaned of all mortar and foreign material before being used.

.3 Surfaces of and within forms shall be cleaned of dirt, chips, sawdust, nails and other foreign materials before concrete is placed.

.4 Formwork shall be thoroughly coated with a commercial quality form coating, which will permit the ready release of the forms and will not discolour the concrete.

  .1 The type of form coating to be used shall be submitted to the Engineer for written approval and shall be applied in accordance with the manufacturers instructions.

.5 Plywood or steel forms shall be used for exposed concrete surfaces except where the Engineer permits the use of lumber in small and intricate portions of the Work.

.6 Plywood shall be of a grade and quality satisfactory to the Engineer.

  .1 Plywood shall be placed with the grain of the outer plies perpendicular to the studding or joists.

  .2 Form panels shall be placed in a neat and symmetrical pattern.

  .3 Horizontal joints shall be level and continuous and vertical joints shall be staggered.

.7 Forms for concrete columns, capbeams and all portions of abutments on overpass and underpass Structures exposed to view shall be either faced with an exterior grade plywood (G1S) with the sanded face placed against the concrete or shall be a commercial grade steel form capable of giving a true and high quality surface finish.

  .1 Plywood forms for rectangular columns shall be made up of the full 2400 mm long sheets placed vertically. All columns with the side dimensions equal to or less than 1200 mm shall be formed with no vertical joints within the face width.

  .2 Rectangular columns with the side dimensions greater than 1200 mm shall be formed with equal width pieces of plywood.

958.2 .8 The Contractor may use boards to construct the forms for concealed surfaces subject to the approval of the Engineer.

.1 Edge contact between boards shall be sufficient to make forms impervious to mortar.

.9 Forms shall be constructed so that form marks will conform to the general lines of the structure.

.1 Column form marks shall be symmetrically spaced.

.10 Exposed sharp edges shall be chamfered with 20 mm by 20 mm triangular fillets.

.1 Where wood triangular fillets or chamfer strips are employed, they shall be milled from clear, straight grain lumber and shall be planed on the side exposed to concrete.

.11 Anchor devices, of a type approved by the Engineer, may be cast into the concrete for use in supporting forms or for lifting precast members.

.1 The use of driven types of anchorages for fastening form or form supports to concrete will not be permitted.

.12 No forms shall be left in place.

958.3 FORM TIES AND BRACING

.1 Internal form ties shall be metal and of a type approved by the Engineer.

.2 Rods, bolts or prefabricated units shall be capable of maintaining the correct concrete thickness and so arranged that the slack or spring in the form framing will be eliminated when tightened.

.3 Form ties shall be of such a type that they can be entirely removed or cut back 25 mm or more below the finished surface of the concrete leaving no metal within 25 mm of the surface.

.4 Ties consisting of twisted wire loops shall not be permitted.

.5 Forms for outside surfaces shall be constructed with stiff wales at right angles to the studs and form ties shall extend through and fasten these wales.

.6 Bracing shall be capable of maintaining the correct form alignment and stability.

958.4 INSPECTION OPENINGS

.1 Temporary openings shall be provided at the bottom of deep units, such as columns and walls, to facilitate cleaning and inspection.

.1 In restrictive areas, openings shall be located so that water can be used to wash out the debris.

958.4.1 .2 Openings shall be closed with patches, flush with the inside surface of adjacent panels.

.2 Where deep sections of concrete are reduced in cross section, as in stepped footings, and where concrete is to be placed continuously, the effect of fluid pressure on the lower portions of the step or Slope shall be addressed by providing partial form tops that will contain the concrete and prevent upward bulge or flow.

.1 Where top forms are complete or large enough to trap air, slots or holes shall be provided to vent air or to permit vibrating of concrete.

958.5 LINES AND GRADES

.1 Forms for girders and slabs shall be cambered to achieve the final lines and grades.

.2 Freely suspended check wires shall be stretched at reasonable intervals from which form alignment can be verified.

.3 Checking and corrective wedging or shoring shall be carried out horizontally and vertically as required before concrete is in place.

.1 All wedges shall be hardwood.

958.6 FORMWORK TOLERANCES

.1 Unless otherwise required in the Contract Documents, the maximum deviations from line, grade and dimension shall be as shown in Table 958-1.

.2 Measurement of concrete in Structures, calculated on the dimensions shown in the Contract Documents, will not be affected by the formwork tolerances listed in Table 958-1.

Table 958-1
Formwork Tolerance Limits

Position in Structure	Tolerance
Finished Bridge Deck	
Grades	± 3 mm
Variation from tolerance	≤3 mm in any 3 m section
Concrete Bridge Bearing Block or Seat	
Grades	± 3 mm
Variation from tolerance	±2 mm in any direction
Columns, piers, walls, beams and similar parts	
Variations from true line	≤5 mm in any 3m section
Variation in cross sectional dimensions	- 5 mm, + 10 mm

continued ...

Table 958-1 continued

Position in Structure	Tolerance
Misplacement or eccentricity in piers, cap beam and Bridge seats	± 10 mm
Variation in slab thickness	- 3 mm, + 5 mm
Footings	
plan dimensions	- 10 mm, + 50 mm
misplacement or eccentricity	± 1% of footing dimension in direction of misplacement but < 50 mm
Variation in sizes and location of slab and wall openings	± 10 mm

958.7 FORMWORK CERTIFICATION

.1 The Contractor shall provide, prior to the placement of concrete or the application of any loading, certification by either a Professional Engineer registered or licensed to practice in the Province of New Brunswick or a person designated by a Professional Engineer, in writing and bearing the seal and signature of a Professional Engineer, to be competent to certify that the formwork has been constructed:

.1 in accordance with the formwork design submitted in accordance with 958.1.5 and 958.1.6, and

.2 of sound materials consistent with the design parameters.

961.1 DESCRIPTION

.1 The concept of Partnering is to develop a proactive effort and spirit of respect, trust and cooperation among all key players in a Contractual relationship. It utilizes a structured systematic methodology for developing a spirit of teamwork and cooperation through shared goals, open communication, problem identification and resolution, conflict escalation procedures and the monitoring of team performance.

961.2 PARTNERING

.1 The Owner encourages partnership with the Contractor and its principal subcontractors and suppliers.

  .1 The Owner anticipates considerable mutual benefit can be achieved on the Contract through Partnering and strongly recommends entering into a voluntary agreement.

.2 This partnership will be structured to draw on the strengths of each organization to identify and achieve reciprocal goals.

.3 The objectives are effective and efficient Contract performance and completion of the Contract within budget, on schedule, and in accordance with Plans and Specifications.

.4 This partnership will be bilateral in makeup, and participation will be totally voluntary.

.5 A representative of the Contractor, and a representative of the Owner will initiate a partnering development seminar/team building workshop which should be held before Work commences on the Contract. These representatives will make arrangements to determine attendees at the workshop and the agenda, duration and location.

  .1 Persons required to be in attendance should include, but are not limited to: key NB-DOT District personnel, the Contract design Engineer(s) and the Contractor's on-site project manager and supervisor(s) as well as key subcontractors.

  .2 Where appropriate, representatives of major suppliers, Department of Environment and Local Government, Workplace Health, Safety & Compensation Commission, Department of Natural Resources & Energy, Canada Department of Fisheries and Oceans, utilities and municipal governments will also be invited to attend.

  .3 The Contractor and DOT will also be required to have Head Office and/or District managers on the project team.

.6 Costs associated with partnering including the facilitator and facilities for a partnering development seminar/team building workshop will be agreed to by the Owner and the Contractor and shall be shared equally.

  .1 Each party will be responsible for their own staff's wages and expenses during the partnering workshop sessions.

.7 Follow-up workshops may be held periodically throughout the duration of the Contract as agreed to by the Contractor and Owner.

961.3 OBJECTIVES OF THE PARTNERING PROCESS

.1 In order for the partnering process to succeed, the Contractor and the Owner, with a positive commitment to honesty and integrity, agree to the following mutual objectives:

  .1 Each will function within the laws and statutes applicable to their duties and responsibilities.

  .2 Each will assist in the other's performance.

  .3 Each will avoid hindering the other's performance.

  .4 Each will proceed to fulfil its obligation diligently.

  .5 Each will cooperate in the common endeavour of the Contract.

961.4 STATEMENT OF INTENT

.1 The Contractor is requested to indicate to the Owner no later than the time of submission of the Initial Work schedule under Item 906, his intentions regarding entering into a voluntary partnership agreement.

962.1 DESCRIPTION

.1 The Contractor may submit to the Engineer, in writing, a Value Engineering Proposal (VEP) for modifying the Plans, Specifications or other requirements of the Contract for the purpose of reducing the total cost of construction without reducing design capacity or quality of the finished product. If accepted, by the Engineer, the net savings resulting from the Value Engineering Proposal will be shared by the Contractor and the Owner (on behalf of the Crown) on a fifty-fifty basis.

.2 This Item applies to all Value Engineering Proposals initiated and developed by the Contractor and which are identified as such by the Contractor at the time of their submission to the Engineer; however, nothing herein shall be construed as requiring the Engineer to approve a Value Engineering Proposal submitted hereunder.

.3 The following information as a minimum shall be provided in the written submission of each Value Engineering Proposal :

  .1 a statement that this proposal is submitted as a Value Engineering Proposal;

  .2 a description of the difference between the existing Contract requirements and the proposed Value Engineering Proposal change;

  .3 a statement concerning the basis for the Value Engineering Proposal and benefits to the Owner together with an itemization of the Contract Items and requirements affected by the Value Engineering Proposal;

  .4 separate detailed cost estimates for both the existing Contract requirements and the proposed Value Engineering Proposal change;

  .5 an itemization of plan details, design standards or Specifications to be changed if the Value Engineering Proposal is adopted;

  .6 a statement of the date by which approval must be issued to obtain the total cost reduction of the Value Engineering Proposal during the remainder of Contract, noting any effect on Contract Completion Date.

.4 The Owner will process the Value Engineering Proposal in the same manner as prescribed for any other proposal which would necessitate issuance of a Contract Change Order.

  .1 The Owner may accept in whole or in part any Value Engineering Proposal by issuing a Change Order which will identify the Value Engineering Proposal on which it is based.

  .2 The Owner will not be liable to the Contractor for failure to accept or act upon any Value Engineering Proposal submitted pursuant to this provision nor for any delays to the Work attributable to any such proposal.

  .3 Until a proposal is effected by Change Order, the Contractor shall remain obligated to the terms and conditions of the existing Contract.

962.1.4 .4 When an executed Change Order has not been issued by the date upon which the Contractor's proposal specifies that a decision thereon should be made, or such other date as the Contractor may subsequently have specified in writing, evaluation of the proposal shall be terminated unless the Contractor further extends the approval date.

.5 The Change Order effecting the necessary Contract modification will establish the estimated net savings agreed upon, provide for adjustment in the Contract prices and indicate that the net savings be equally divided between the Contractor and the Owner.

.5 The Contractor shall absorb all costs incurred in preparing a Value Engineering Proposal for submission to the Owner. Costs incurred by the Owner in evaluating, approving or rejecting, and administering a Value Engineering Proposal will be borne by the Owner.

.6 The cost of any redesign resulting from the Value Engineering Proposal will be shared equally between the Contractor and the Owner.

.7 The Owner reserves the right to include in the Change Order any conditions it deems appropriate for implementation of the proposal.

.8 The Contractor's fifty percent share of the net savings shall constitute full compensation for effecting all changes pursuant to the Value Engineering Proposal Change Order.

.9 Acceptance of the Value Engineering Proposal and performance of the Work thereunder will not change the Contract Completion Date unless specifically provided for in the Change Order authorizing the Value Engineering Proposal.

.10 The Owner expressly reserves the right to adopt a Value Engineering Proposal for general use in Contracts administered by the Owner when it determines the Value Engineering Proposal is suitable for application to other Contracts without obligation or compensation of any kind to the Contractor.

.11 Proposed changes in the basic design of a Bridge or Pavement type, or changes which require different Right-of-Way limits or proposals involving Work outside the scope of the Contract, will not normally be considered as an acceptable Value Engineering Proposal.

.12 When a Value Engineering Proposal is accepted by the Owner, the provisions of Sections 2(3) and 2(4) of Article II of the Articles of Agreement pertaining to adjustment of Contract Unit Price due to alterations of Contract quantities will not apply to the Items adjusted or deleted as a result of effecting the Value Engineering Proposal by Change Order.

.13 The cost of the revised Work, as determined in the Value Engineering Proposal Change Order, will be paid by the standard monthly Progress Estimates.

.14 In addition to such payment, the Contractor will be paid, on a Lump Sum basis by a separate Item, one half of the difference (net savings) between the cost of the original Contract Work and the final cost of the revised Work listed in the Change Order.

.15 One half of the Contractor's share of the estimated net savings will be paid to the Contractor upon approval of the Value Engineering Proposal Change Order. The remainder due to the Contractor will be paid upon completion of all Items of Work included in the Value Engineering Proposal Change Order. The final payment will be determined by the actual quantities for Items paid by the unit or by the Change Order amount for the lump sum Items.

971.1 DESCRIPTION

.1 This Item defines other activities and circumstances, which may influence the Contractor's Work.

.2 The following advisements may not apply to all Contracts and the Contractor should become familiar with the conditions of the Contract in order to note what other activities may limit his Work schedule or progression of Work.

971.2 UTILITIES AND INSTALLATIONS

.1 Utility poles, lines and/or cables within the Work Site will be moved by the appropriate Utility company.

.2 Underground services including but not limited to water, sewer and/or drainage pipes may be relocated by others during the period of the Contract.

.3 Delays due to Work performed by others related to Utility moves will not be considered as a basis of claim.

.4 Although the Owner makes every reasonable effort to collect and present complete details concerning Utility installations, the Owner makes no guarantees, representations, warranties, either expressed or implied, with respect to any such information, and the Contractor shall have no claim on that account.

.5 The Contractor shall assume full responsibility for determining exact locations of, as well as safeguarding, all existing and relocated Utility installations during the progress of the Work.

.6 The Contractor will be responsible, at his own expense, for any damage to existing or relocated Utility installations and will be responsible for any repairs resulting from damage to these installations.

971.3 RAILWAYS

.1 Any railway crossing existing within the Work Site may require adjustment and this Work will be done by the appropriate authority and shall be completed to conform with the new Pavement level.

.2 The Contractor shall notify the Engineer at least fourteen Days prior to the confirmed commencement of the Work in the proximity of the railway lands, so that the appropriate railways authorities may be notified.

.3 The Contractor shall be responsible, at his own expense, for any injury or death to any persons whatsoever and for any damage to the property of the railway, having jurisdiction, or otherwise or indirectly results from, is caused by, or is attributable to, the performance of the Work within the railway ROW.

971.3 .4 Delays due to the adjustment of the crossing, by others, will not be considered as a basis of claim.

.5 Delays due to work by the railway or scheduling requirements will not be considered as a basis of claim.

.6 Notification shall be provided in the Contract at the time of Tender, if applicable.

971.4 CONTROLLED ACCESS HIGHWAY

.1 The Contractor should note that for Highways in the area of the Contract which have controlled access, the following shall apply:

  .1 In areas outside the Work Site, regulations pertaining to a controlled access Highway will not be waived to facilitate construction.

  .2 Within the Work Site, any access to the existing Highway shall be only by prior approval of the Engineer in order to ensure the safe handling of traffic.

.2 Notification as to the location and extent of controlled access portions of Highway shall be provided in the Contract at the time of Tender, if applicable.

971.5 RIGHT-OF-WAY

.1 Right-of-Way for the Contract may not be available before a specific date.

.2 Delays resulting from the unavailability of Right-of-Way will not be considered as a basis of claim.

.3 Notification shall be provided in the Contract at the time of Tender, if applicable.

971.6 OTHER CONTRACT(S)

.1 Other contract(s) and/or the Owner's forces may be conducting work that may be in progress at the commencement of the Contract or may commence during the period of the Contract and will have separate and distinct completion dates.

.2 Work on this Contract must be scheduled so as not to interfere with or cause delays to any such work by others.

.3 Delays due to conflicts between other contracts and/or the Owner's forces and this Contract shall not be a basis for claim.

.4 Notification shall be provided in the Contract at the time of Tender, if applicable.

996.1 DESCRIPTION

.1 The provisions under this Item are an amendment of, supplementary to and not in substitution for the provisions of the Contract and provide for the completion of a portion of the Work by the Limited Funds Date.

.2 The type of Work is not specified, rather the value of the Work carried out shall be used to determine successful performance.

.3 Under this Item, and as designated in the Contract Documents, the following phrases shall have the meaning ascribed to them as follows:

  .1 "Limited Funds" means the designated sum of money which sum is exclusive of the engineering and materials costs of the Owner;

  .2 "Limited Funds Date" means the specified date (year, month and Day); and

  .3 "Present Fiscal Year" means the fiscal year of the Owner commencing with April 1, of the year in which the Contract was signed, and ending with March 31 of the year immediately following.

.4 In carrying out the Work to be performed on the Contract, the Contractor shall, on or before the Limited Funds Date, perform Work having a value calculated in accordance with the Contract, equal to not less than 95%, and not more than 105% of the Limited Funds.

.5 Request for an extension to the Limited Funds Date shall be made as detailed in 996.3.

996.2 PROVISIONS

.1 The following provisions apply to the Work to be done with respect to the Limited Funds Date and the payment therefor:

  .1 The value of the Work performed, in compliance with this Item, shall be determined by reference to progress claims, approved by the Engineer;

  .2 The Contractor shall cease Work on the Contract in the Present Fiscal Year on the Day on which Work of a value equal to not less than 95%, and not more than 105% of the Limited Funds has been completed.

  .3 The Owner shall not be obligated to pay to the Contractor an amount exceeding the lesser of the actual value of the Work done or 105% of the Limited Funds, for Work done on the Contract during the Present Fiscal Year.

  .4 The Contractor shall not again commence Work on the Contract until after the last Day of the Present Fiscal Year, once the Limited Funds obligation has been completed.

996.2 .2 In the event the Contractor does not perform Work having a value equal to or greater than 95% of the Limited Funds on or before the Limited Funds Date, the Contractor shall pay a penalty to the Owner, at a prescribed daily rate as set out in the Contract Documents, for each Day, except Sunday(s) and statutory holidays, that such shortfall continues beyond the Limited Funds Date.

  .1 The penalty shall continue to be paid until the value of Work completed is equal to 95% or greater of the Limited Funds.

.3 Without exception, nothing in these provisions with respect to Limited Funds and the Limited Funds Date shall alter the Contract Completion Date specified in Article I of the Articles of Agreement of the Contract.

996.3 CONSIDERATIONS FOR ADJUSTMENT

996.3 .1 Requests for consideration of extension of the Limited Funds Date shall be submitted by the Contractor in accordance with General Conditions "B".

.2 The Owner may consider a request for adjustment to the Limited Funds Date if the Work is delayed through no fault of the Contractor.

  .1 Additional Days may be granted for Extra Work performed, provided the Contractor can show that the Extra Work could not be carried out without interfering with his Work Schedule.

  .2 Additional Days may be granted for increases in Work or material in greater amounts or Quantities than those set forth in the Contract in the same proportion of time as the additional Work and/or materials bears to the Initial Work Schedule.

  .3 An additional Day may be granted for each Day that the number of hours lost, due to weather conditions, exceeds 40% of the Contractor's normal working hours.

    .1 The "Work Time Lost Due to Weather Conditions" form is considered as official documentation of work time lost due to weather conditions.

997.1 DESCRIPTION

.1 The provisions under this Item specify that certain Work under the Contract, hereinafter described as Specified Work, shall be completed by the Specified Work Date, as designated in the Contract Documents.

.2 Under this Item, and as designated in the Contract Documents, the following phrases shall have the meaning ascribed to them as follows:

  .1 "Specified Work" means a defined task having a finite and measurable scope and the definition of the scope of the Work shall be fully described in the Contract Documents.

  .2 "Specified Work Date" means the designated date (year, month, Day) as specified in the Contract Documents.

.3 The Contractor shall note that there may be more than one instance of Specified Work and Specified Work Date within the terms of the Contract, depending on the requirements of the Owner.

.4 In carrying out the Work to be performed on the Contract, the Contractor shall, on or before each Specified Work Date, perform the Specified Work, in each case.

.5 Request for an extension to the Specified Work Date shall be made as detailed in 997.3

997.2 PROVISIONS

.1 When more than one instance of Specified Work is identified in the Contract Documents, then these provisions shall apply for each case exclusively.

.2 The noted provisions following shall apply to Specified Work to be done and the payment therefor.

  .1 The Specified Work performed and completed in compliance with this Item shall be determined by reference to progress estimates approved by the Engineer.

  .2 In the event the Contractor does not perform the Specified Work on or before the Specified Work Date, the Contractor shall pay a penalty to the Owner, at a prescribed daily rate as set out in the Contract Documents, for each Day, except Sunday(s) and statutory holidays, that such shortfall continues beyond the Specified Work Date, and this shall continue to be paid until the Specified Work is completed.

  .3 Without exception, nothing in these provisions with respect to Specified Work and the Specified Work Date shall alter the Contract Completion Date as specified in Article I of the Articles of Agreement of the Contract.

997.3 CONSIDERATIONS FOR ADJUSTMENT

.1 Requests for consideration of extension of the Specified Work Date shall be submitted by the Contractor in accordance with General Conditions "B".

.2 The Owner may consider a request for adjustment to the Specified Work Date if the Work is delayed through no fault of the Contractor.

  .1 Additional Days may be granted for Extra Work performed, provided the Contractor can show that the Extra Work could not be carried out without interfering with his Work Schedule.

  .2 Additional Days may be granted for increases in Work or material in greater amounts or Quantities than those set forth in the Contract in the same proportion of time as the additional Work and/or materials bears to the Initial Work Schedule.

  .3 An additional Day may be granted for each Day that the number of hours lost, due to weather conditions, exceeds 40% of the Contractor's normal working hours.

    .1 The "Work Time Lost Due to Weather Conditions" form is considered as official documentation of Work time lost due to weather conditions.

998.1 DESCRIPTION

.1 The Completion Date shall be as stated in the Articles of Agreement and/or as specified in the Contract Documents.

.2 In the event the Contractor does not complete the Work on or before the Completion Date specified, the Contractor shall pay a penalty to the Owner, at a prescribed daily rate as set out in the Contract Documents, for each Day, except Sunday(s) and statutory holidays, that such shortfall continues beyond the specified Completion Date, and this shall continue to be paid until the Work is completed.

.3 Request for an extension to the Completion Date shall be made as detailed in 998.2.

998.2 CONSIDERATIONS FOR ADJUSTMENT

.1 Requests for consideration of extension of the Completion Date shall be submitted by the Contractor in accordance with General Conditions "B".

.2 The Owner may consider a request for adjustment to the Completion Date if the Work is delayed through no fault of the Contractor.

  .1 Additional Days may be granted for Extra Work performed, provided the Contractor can show that the Extra Work could not be carried out without interfering with his Work Schedule.

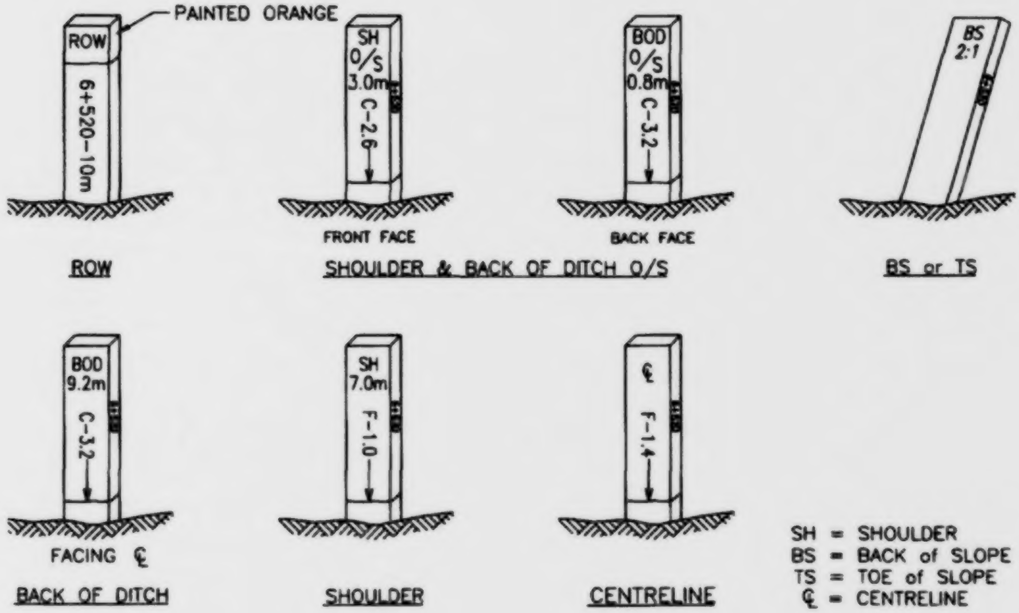
  .2 Additional Days may be granted for increases in Work or material in greater amounts or Quantities than those set forth in the Contract in the same proportion of time as the additional Work and/or materials bears to the Initial Work Schedule.

  .3 An additional Day may be granted for each Day that the number of hours lost, due to weather conditions, exceeds 40% of the Contractor's normal working hours.

    .1 The "Work Time Lost Due to Weather" form is considered as official documentation of work time lost due to weather conditions.

Staking for Back of Ditch and Shoulder Offsets at Right of Way

As Shoulder and BOD staking is done, reference stakes should be set next to the Right of Way . As the Shoulder and BOD stakes are graded, the reference stakes should also be graded. This will enable the Contractor, the Engineer and/or others to check the grades without having to set up, stake, and grade.


PAINTED ORANGE
ROW
6+520-10m
SH
O/S
3.0m
C-2.6
BOD
O/S
0.8m
C-3.2
BS
2:1
FRONT FACE
BACK FACE
ROW
SHOULDER & BACK OF DITCH O/S
BS or TS
BOD
9.2m
C-3.2
SH
7.0m
F-1.0
℄
F-1.4
FACING ℄
BACK OF DITCH
SHOULDER
CENTRELINE

SH = SHOULDER
BS = BACK of SLOPE
TS = TOE of SLOPE
℄ = CENTRELINE

C = CUT
F = FILL

ROW = RIGHT OF WAY
BOD = BACK OF DITCH
O/S = OFFSET
GR = GRADE

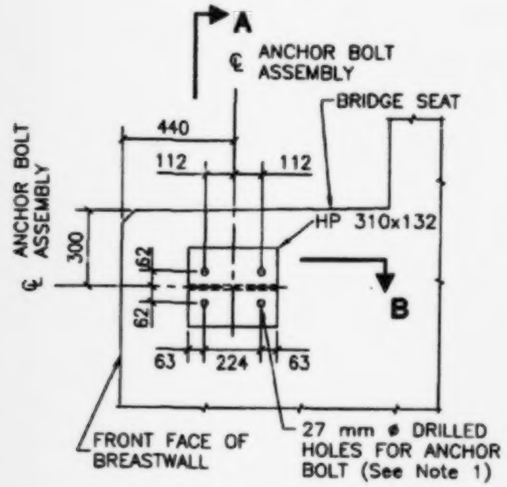
NOTE:
- SHOULDER AND ℄ STAKES ARE PLACED FACING IN DIRECTION OF CHAINAGE.
- STAKES ARE GRADED ON BOTH SIDES.
- STATIONING IS MARKED ON EDGE OF STAKES.

The front face of the reference stake should indicate the offset distance to the Shoulder as well as the grade.

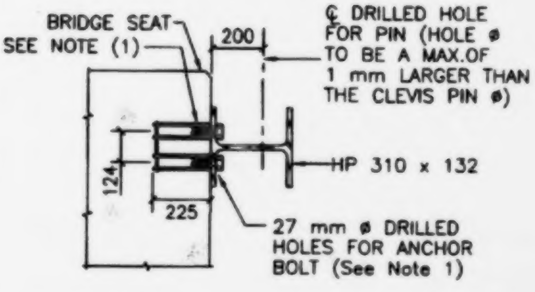
The back face of the reference stake should indicate the offset distance to the back of ditch as well as the grade.

The edge of the reference stake can be used to reference the stationing.

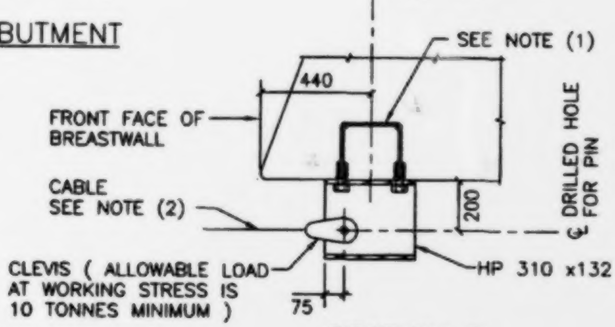
Standard Stake Markings


A
℄ ANCHOR BOLT ASSEMBLY
BRIDGE SEAT
440
112
112
℄ ANCHOR BOLT ASSEMBLY
300
62
62
HP 310x132
B
63
224
63
FRONT FACE OF BREASTWALL
27 mm ø DRILLED HOLES FOR ANCHOR BOLT (See Note 1)

SIDE ELEVATION OF ABUTMENT


BRIDGE SEAT
SEE NOTE (1)
200
℄ DRILLED HOLE FOR PIN (HOLE ø TO BE A MAX.OF 1 mm LARGER THAN THE CLEVIS PIN ø)
HP 310 x 132
124
225
27 mm ø DRILLED HOLES FOR ANCHOR BOLT (See Note 1)

SECTION A


℄ ANCHOR BOLT ASSEMBLY
SEE NOTE (1)
440
FRONT FACE OF BREASTWALL
℄ DRILLED HOLE FOR PIN
CABLE SEE NOTE (2)
200
CLEVIS (ALLOWABLE LOAD AT WORKING STRESS IS 10 TONNES MINIMUM)
HP 310 x132
75

SECTION B

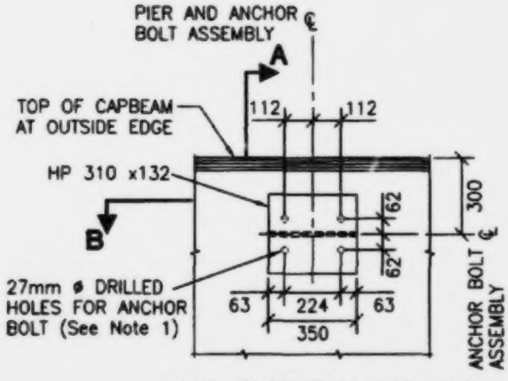
NOTES:

(1) ANCHOR BOLT ASSEMBLY TO BE ACROW RICHMOND WITH FOUR 25mm ø x 100mm ANCHOR BOLTS CONFORMING TO ASTM A325. ANCHOR ASSEMBLIES TO BE SUPPLIED BY D.O.T. AND INSTALLED BY BRIDGE CONTRACTOR.

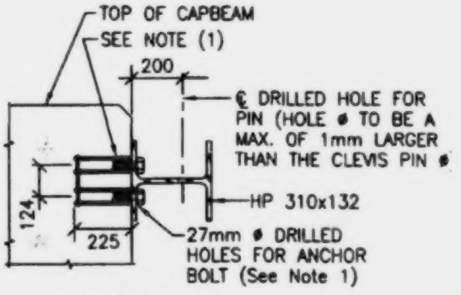
(2) CABLE TO BE 16mm CABLE, 6x19 SEALE, IMPROVED PLOW STEEL PREFORMED, LANG LAY, I.W.R.C.

DETAILS OF SUPPORT SYSTEM FOR SAFETY NET LINES AT ABUTMENTS

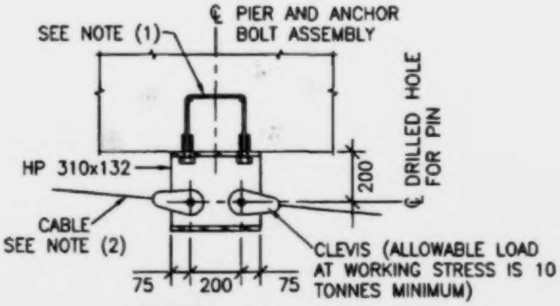
Safety Net Support System
Abutments


PIER AND ANCHOR BOLT ASSEMBLY ℄
A
TOP OF CAPBEAM AT OUTSIDE EDGE
112
112
HP 310 x132
300
62
62
℄
B
27mm ⌀ DRILLED HOLES FOR ANCHOR BOLT (See Note 1)
63
224
63
350
ANCHOR BOLT ℄ ASSEMBLY

SIDE ELEVATION OF PIER


TOP OF CAPBEAM
SEE NOTE (1)
200
℄ DRILLED HOLE FOR PIN (HOLE ⌀ TO BE A MAX. OF 1mm LARGER THAN THE CLEVIS PIN ⌀
HP 310x132
124
225
27mm ⌀ DRILLED HOLES FOR ANCHOR BOLT (See Note 1)

SECTION A


℄ PIER AND ANCHOR BOLT ASSEMBLY
SEE NOTE (1)
HP 310x132
200
℄ DRILLED HOLE FOR PIN
CABLE SEE NOTE (2)
CLEVIS (ALLOWABLE LOAD AT WORKING STRESS IS 10 TONNES MINIMUM)
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200
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SECTION B

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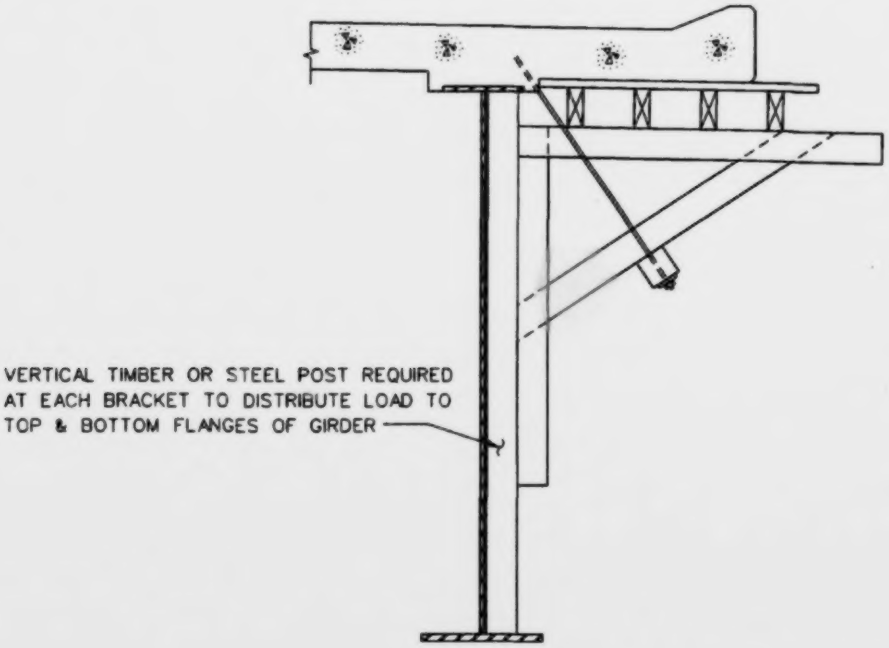
(2) CABLE TO BE 16mm CABLE, 6x19 SEALE, IMPROVED PLOW STEEL PREFORMED, LANG LAY, I.W.R.C.

DETAILS OF SUPPORT SYSTEM FOR SAFETY NET LINES AT PIERS

Safety Net Support System
Piers



VERTICAL TIMBER OR STEEL POST REQUIRED AT EACH BRACKET TO DISTRIBUTE LOAD TO TOP & BOTTOM FLANGES OF GIRDER

NOTE :
VERTICAL STIFFENER PLATES CANNOT BE USED FOR THIS PURPOSE

Deck Overhang Bracket
Steel Girder

PROVINCE OF NEW BRUNSWICK

SHORT FORM CONTRACT

CROWN CONSTRUCTION CONTRACTS ACT

New Nouveau Brunswick

SHORT FORM CONTRACT
77-1120E(1/92)

PROVINCE OF NEW BRUNSWICK

THIS CONTRACT MADE IN DUPLICATE THIS .... DAY OF... 20 .... BETWEEN:
HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NEW BRUNSWICK REPRESENTED HEREIN BY THE MINISTER OF TRANSPORTATION
HEREIN AFTER REFERRED TO AS THE "OWNER "OF THE FIRST PART
AND..HER
EINAFTER REFERRED TO AS THE "CONTRACTOR" OF THE SECOND PART.

WITNESSETH THAT IN CONSIDERATION OF THE MUTUAL COVENANTS AND AGREEMENTS HEREIN CONTAINED, AND SUBJECT TO THE TERMS AND CONDITIONS HEREINAFTER SET OUT, THE PARTIES COVENANT AND AGREE AS FOLLOWS:

1. THE OWNER SHALL

(a) PAY TO THE CONTRACTOR IN CONSIDERATION OF THE WORK TO BE PERFORMED BY THE CONTRACTOR THE SUM OF

WHICH SUM SHALL BE SUBJECT TO

(i) A FIVE PERCENT HOLDBACK WHERE A PERFORMANCE BOND, A LABOUR AND MATERIALS PAYMENT BOND OR A SECURITY DEPOSIT IS APPLICABLE TO THE CONTRACT.

(ii) A FIFTEEN PERCENT HOLDBACK WHERE NO SUCH BONDS OR SECURITY DEPOSIT IS APPLICABLE, AND THE CONTRACT VALUE IS GREATER THAN FIVE THOUSAND DOLLARS OR

(iii) A FIFTEEN PERCENT HOLDBACK WHERE NO SUCH BONDS OR SECURITY DEPOSIT IS APPLICABLE, THE CONTRACT VALUE IS FIVE THOUSAND DOLLARS OR LESS AND THE OWNER HAS IN SECTION 6 ELECTED TO RETAIN A HOLDBACK.

(b) PAY THE HOLDBACK MONIES TO THE CONTRACTOR LESS ANY PORTION THEREOF OR PROPERLY RETAIN BY THE OWNER UPON THE EXPIRATION OF SIXTY DAYS FROM COMPLETION OF THE WORK, AND

(c) MAKE THE PAYMENT SET OUT IN PARAGRAPH (a) LESS HOLDBACK UPON COMPLETION OF THE WORK

2. THE CONTRACTOR SHALL

(a) PERFORM THE WORK DESCRIBED IN SECTION 5(2) IN ACCORDANCE WITH THE TERMS OF THIS CONTRACT, THE TENDER DOCUMENTS AND THE SPECIFICATIONS ATTACHED HERETO, IF ANY,

(b) FURNISH ALL PLANT, LABOUR, EQUIPMENT, TOOLS AND MATERIALS, OTHER THAN THOSE SUPPLIED BY THE OWNER IN ACCORDANCE WITH SECTION 4, NECESSARY TO COMPLETE THE WORK, AND

(c) COMPLETE THE WORK TO THE SATISFACTION OF THE ENGINEER-ARCHITECT ON OR BEFORE THE .... DAY OF........................... 20 ....

3. THIS CONTRACT IS SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS: (a) TIME IS OF THE ESSENCE, (b) AS FAR AS PRACTICABLE, NEW BRUNSWICK LABOUR AND MATERIAL SHALL BE UTILIZED BY THE CONTRACTOR, (c) THE CONTRACTOR SHALL NOT, WITHOUT THE PRIOR WRITTEN CONSENT OF THE OWNER, ASSIGN OR SUBLET ALL OR ANY PORTION OF THIS CONTRACT, (d) NO CLAIM FOR EXTRA WORK SHALL BE RECOGNIZED BY THE OWNER UNLESS APPROVED IN WRITING BY THE ENGINEER-ARCHITECT, (e) THE CONTRACTOR SHALL ALLOW OFFICERS OF THE OWNER FREE ACCESS TO THE WORK, AND (f) THE ENGINEER-ARCHITECT MAY IN WRITING DESIGNATE PERSONS TO ACT ON HIS BEHALF.

4. THE OWNER WILL SUPPLY THE FOLLOWING MATERIALS FREE ON BOARD THE LOCATION INDICATED (IF NONE INDICATE N A)

N/A OR AS PER THE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS AND PARTICULAR SPECIFICATIONS

5. (1) THIS CONTRACT IS A LUMP SUM UNIT PRICE
(2) THE CONTRACTOR SHALL COMPLETE THE FOLLOWING DESCRIBED WORK IN ACCORDANCE WITH THE TERMS OF THIS CONTRACT, AND, IF A UNIT PRICE CONTRACT, CARRY OUT THAT WORK AT THE PRICES SET OUT HEREIN.

THE ATTACHED TENDER SUBMISSION AND MARKED "F" FORMS PART OF THIS CONTRACT

THE FOLLOWING ATTACHED ARTICLES OF AGREEMENT FORM PART OF THIS CONTRACT

1. GENERAL CONDITIONS FOR BUILDING MOVES AND MARKED "B"
2. ADDENDUM NO. .... AND MARKED "C"
3. INSURANCE SCHEDULE AND MARKED "E"
4. TENDER SUBMISSION AND MARKED "F"
5. PARTICULAR SPECIFICATIONS AND MARKED "G"
6. PLANS AND SPECIFICATIONS AND MARKED "G"
7. AFFIDAVIT AND MARKED "I"

ALL WORK SHALL BE CARRIED OUT ACCORDING TO THE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS AND UNDER THE SUPERVISION AND TO THE SATISFACTION OF THE DISTRICT TRANSPORTATION ENGINEER, ...OR HIS/HER REPRESENTATIVE.

ALL WORK SHALL BE CARRIED OUT UNDER THE SUPERVISION AND TO THE SATISFACTION OF THE DISTRICT TRANSPORTATION ENGINEER, ... N.B. OR HIS/HER REPRESENTATIVE.

ALL WORK SHALL BE CARRIED OUT UNDER THE SUPERVISION AND TO THE SATISFACTION OF THE DEPARTMENT OF TRANSPORTATION DIRECTOR OF ...., FREDERICTON, N.B., OR HIS/HER REPRESENTATIVE.

6. IF THIS SECTION IS INITIALLED BY THE OWNER, IT SIGNIFIES THAT THE OWNER HAS ELECTED TO RETAIN A HOLDBACK AND IF NOT INITIALLED, THAT HE HAS ELECTED NOT TO RETAIN A HOLDBACK . ...(INITIALS)

7. THE CONTRACTOR CERTIFIES THAT HE NOW HAS AND WILL KEEP IN FORCE DURING THE TERM OF THE CONTRACT LIABILITY INSURANCE PER THE ATTACHED CONFIRMATION OF COVERAGE.

8. THE CONTRACTOR HEREBY AGREES TO INDEMNIFY AND SAVE HARMLESS THE OWNER FROM AND AGAINST ALL CLAIMS, DEMANDS, SUITS, ACTIONS OR PROCEEDINGS WHICH MAY NOW OR HEREAFTER BE BROUGHT, MAINTAINED OR INSTITUTED AGAINST THE OWNER BY ANY PERSON ARISING OUT OF IN RELATING TO OCCASIONED BY OR IN ANY WAY ATTRIBUTABLE TO THE CARRYING OUT OF THE WORK HEREUNDER BY THE CONTRACTOR, HIS SUBCONTRACTORS, SUPPLIERS, SERVANTS OR AGENTS OR IN ANY WAY RELATING TO THE INFRINGEMENT OF ANY PATENT OR COPYRIGHT BY ANY OF THEM IN RELATION TO THE WORK.

IN WITNESS WHEREOF THE RESPECTIVE PARTIES HAVE EXECUTED THIS CONTRACT ON THE DAY AND YEAR FIRST ABOVE WRITTEN

OWNER
SIGNATURE .... MINISTER OF TRANSPORTATION
....

....
WITNESS

CONTRACTOR
SIGNATURE ....
....
....

....
WITNESS

CONTRACT NO PROJECT NO FILE
PROJECT NAME
ISSUED BY THE DEPARTMENT OF TRANSPORTATION ISSUED TO
AWARD OF CONTRACT RECOMMENDED

DEPOSIT: C. CHEQUE $ /NO DEPOSIT / DEPOSIT: BONDS

PROVINCE OF NEW BRUNSWICK

STANDARD CONSTRUCTION CONTRACT

CROWN CONSTRUCTION CONTRACTS ACT

PROJECT:

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7 Owner's Right of Set-off
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3 Assignment
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5 Scope of Work
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38 Relations with Other Contractors
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44 Determination of Cost - Agreement
45 Determination of Cost - Cost Plus
46 Definition or Determination of Cost
47 Maintain Records by Contractor
48 Work Schedule
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50 Contractor's Job Office
51 Record of Imported Plant
52 Copy Purchase Orders
53 Arbitration

ARTICLES OF AGREEMENT

THESE ARTICLES OF AGREEMENT made in duplicate this day of 20 :

BETWEEN: HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF NEW BRUNSWICK REPRESENTED HEREIN BY THE MINISTER OF TRANSPORTATION

(referred to in the documents forming the contract as the "Owner")

AND:________________________, A DULY INCORPORATED COMPANY UNDER THE LAWS OF THE PROVINCE OF NEW BRUNSWICK

(referred to in the documents forming the contract as the "Contractor")

WITNESS that the Owner and the Contractor covenant and agree as follows:

ARTICLE I

The Contractor shall in a careful and workmanlike manner execute the following work within the time herein limited:

which work is more particularly described in the documents that are attached hereto, entitled "Plans and Specifications" marked "G" (referred to in the documents forming the contract as the "Plans and Specifications") at the place and in the manner therein set out.

ARTICLE II

1 The Owner shall pay to the Contractor as consideration for the execution of the portion of the work to which the fixed price arrangement is applicable the sum of $ (subject to any additions or deductions provided for in these Articles, the General Conditions, the Terms of Payment or the Labour Conditions, except any addition or deduction which is expressly stated to be applicable only to a unit price arrangement), at the times and in the manner set out or referred to in the document that is attached hereto entitled "Terms of Payment" and marked "A" (referred to in the documents forming the contract as the "Terms of Payment").

2(1) The Owner shall pay to the Contractor as consideration for the execution of the portion of the work to which the unit price arrangement is applicable a sum equal to the number of units of measurement of each class of labour, plant or material actually performed, used or supplied by the Contractor in the execution of the work as measured by the Engineer-Architect and set out in the Engineer-Architect's Final Certificate multiplied by the price of each such unit of measurement as set out in the Unit Price Table as added to or amended in accordance with subsections (2), (3) and (4) (such sum being subject to any additions or deductions provided for in the General Conditions, Terms of Payment, Labour Conditions, except any addition or deduction which is expressly stated to be applicable only to a fixed price arrangement) at the times and in the manner set out or referred to in the document that is attached hereto entitled "Terms of Payment" and marked "A" (referred to in the documents forming the contract as the "Terms of Payment").

2(2) The Engineer-Architect and the Contractor may by agreement in writing add to the Unit Price Table, as set out in the contract documents, classes of labour, plant or material together with units of measurement, prices per unit and estimated quantities therefor where any labour, plant or material which will be included in the Engineer-Architect's Final Certificate is not included in any class of labour, plant or material set out in the Unit Price Table.

2(3) The Engineer-Architect and the Contractor may by agreement in writing amend the price per unit set out in the Unit Price Table for any class of labour, plant or material included therein where an estimated quantity is set out therein for that class of labour, plant or material, if the Engineer-Architect's Final Certificate shows or will show that the total quantity of that class of labour, plant or material performed, used or supplied by the Contractor in executing the work is less than seventy-five percent of that estimated quantity, and the price per unit agreed under this subsection shall apply to the number of units supplied.

2(4) The Engineer-Architect and the Contractor may by agreement in writing amend the price per unit set out in the Unit Price Table for any class of labour, plant or material included therein where an estimated quantity is set out therein for that class of labour, plant or material, by establishing a price per unit for units of that class of labour, plant or material performed, used or supplied by the Contractor in executing the work which are in excess of one hundred and twenty-five percent of that estimated quantity, and the price per unit agreed to under this subsection shall be applicable only to those units which are in excess of one hundred and twenty-five percent of the estimated quantity.

2(5) For the information and guidance of the Contractor and the persons administering the contract on behalf of the Owner, but not so as to constitute a warranty, representation or undertaking of any nature, either by the Owner to the Contractor or by the Contractor to the Owner, it is estimated that the total amount payable by the Owner to the Contractor for the portion of the work to which the unit price arrangement is applicable

is.____.

3 Section 1 is not applicable where the unit price arrangement applies to the whole of the work.

4 Section 2 is not applicable where the fixed price arrangement applies to the whole of the work.

ARTICLE III

1 Subject to sections 2 and 3 of this Article, bound documents (A) and (B) in addition to attached documents (C), (D), (E), (F), (G) and (H) hereto entitled

(A) "Terms of Payment" and marked "A";

(B) "General Conditions" and marked "B";

N/A (C) "Supplementary General Conditions" and marked "C" (if none, insert not applicable);

N/A (D) "Labour Conditions" and marked "D";

(E) "Insurance Schedule" and marked "E";

(F) "Tender Submission" and marked "F";

(G) "Plans and Specifications" and marked "G";

N/A (H) "Post-tender Documents" and marked "H"; and

(I) "Affidavit" and marked "I"

all form part of the contract between the Owner and the Contractor.

2 Any provisions of these Articles, the Terms of Payment and the General Conditions which are expressly stated to be applicable only to a unit price arrangement are not applicable to the whole or to the portion of the work to which the fixed price arrangement is applicable.

3 Any provisions of these Articles, the Terms of Payment and the General Conditions which are expressly stated to be applicable only to a fixed price arrangement are not applicable to the whole or to the portion of the work to which the unit price arrangement is applicable.

ARTICLE IV

1 With respect to the execution of the work by the Contractor,

(a) the security deposit having a current market value of $ that has been deposited with the Owner by the Contractor for the due fulfilment of the contract shall be dealt with in accordance with the provisions concerning security deposit in the General Conditions, or

(b) a surety company has furnished or has undertaken to furnish a Performance Bond, (insert details - name of company, amount, date, etc.)

and a Labour and Material Payment Bond, (insert details - name of company, amount, date, etc.)

which bond or bonds shall operate according to their tenor.

2 Where bonds are provided under paragraph 1(b), the Contractor shall post on the site of the work a notice that a Labour and Material Payment Bond is in force together with the name and address of the surety company thereunder, a definition of those persons protected thereunder and outline of the procedure for submitting a claim thereunder.

ARTICLE V

For all purposes of or incidental to the contract, the Contractor's address shall be deemed to be:

____

____

ARTICLE VI

The Unit Price Table is the Unit Price Table contained in the Tender.

SIGNED, SEALED AND DELIVERED

In the Presence of:

Witness	"The Owner"
______________________	MINISTER OF TRANSPORTATION
______________________	______________________
______________________	______________________
Witness	"The Contractor"
______________________	______________________
______________________	______________________
______________________	______________________

TERMS OF PAYMENT "A"

TOTAL PAYMENT

1 Subject to the provisions of sections 16 and 19 of the General Conditions, the Owner shall pay to the Contractor at the times and in the manner hereinafter set out the amount by which

(a) the aggregate of the amounts described in section 2 exceeds

(b) the aggregate of the amounts described in section 3

and the Contractor shall accept the payment as full consideration for everything furnished and done by him in respect of the work.

DETAIL OF PARAGRAPH 1(a)

2 The amounts referred to in paragraph 1(a) are:

(a) the amount payable to the Contractor pursuant to Article II of the Articles of Agreement;

(b) the amount, if any, payable to the Contractor pursuant to section 12 of the General Conditions relating to soil conditions, neglect or delay;

(c) the amount, if any, payable to the Contractor on account of a suspension of work pursuant to section 18 of the General Conditions;

(d) the amount, if any, payable to the Contractor pursuant to section 36 of the General Conditions relating to work not required to be done under the contract but done by the Contractor under a disputed decision or direction of the Engineer-Architect; and

(e) the amount, if any, payable to the Contractor by reason of an order or change pursuant to section 37 of the General Conditions.

DETAIL OF PARAGRAPH 1(b)

3 The amounts referred to in paragraph 1(b) are:

(a) the amount, if any, payable to the Owner pursuant to section 12 of the General Conditions relating to soil conditions;

(b) the amount, if any, which the Contractor is liable to pay to the Owner pursuant to section 14 of the General Conditions relating to damage to the Owner's material, plant and real property;

(c) in the event of a delay in completing the work, the amount payable to the Owner pursuant to section 15 of the General Conditions;

(d) the amount, if any, paid by the Owner in satisfaction of obligations of the Contractor or a subcontractor pursuant to section 20 of the General Conditions or pursuant to the Labour Conditions;

(e) the amount, if any, payable by the Contractor to the Owner pursuant to section 35 of the General Conditions relating to matters done by the Owner which the Contractor refused or failed to do; and

(f) the amount, if any, by which the cost of the work to the Contractor was decreased by reason of dispensations or changes pursuant to section 37 of the General Conditions.

PROGRESS PAYMENTS

4(1) For the purposes of this section, "Payment Period" means an interval of thirty days or such other interval as the Contractor and Engineer-Architect agree upon.

4(2) The Contractor and Engineer-Architect shall, either before or immediately after the signing of the Articles of Agreement, agree on a schedule of provisional unit prices to be used in the preparation of progress claims.

4(3) On or after the end of each Payment Period, a progress claim in writing showing the amount of each class of work performed and materials furnished during such Payment Period, with the value thereof computed in accordance with the schedule of provisional unit prices where applicable or the table of unit prices where applicable, shall be prepared by the Contractor and submitted in triplicate to the Engineer-Architect for approval.

4(4) The Engineer-Architect shall within ten days endorse his approval or amended approval on the copies of the progress claim, after making such alterations therein as he may deem proper, and shall forward one copy to the Owner, return one copy to the Contractor, and retain one copy in his possession and the progress claim so approved shall be the basis of the payment by the Owner under subsection (6).

4(5) In respect of each progress claim, the Contractor shall deliver to the Owner

(a) a Statutory Declaration deposing, or

(b) if required by the Owner, documentary proof verifying,

the fact that all his lawful obligations to subcontractors, workmen and suppliers of material in respect of the work as at a date not greater than forty-five days prior to the date of the progress claim have been fully discharged.

4(6) The Owner shall, within twenty days after receipt of the approved progress claim from the Engineer-Architect and receipt of the statutory declaration or proof of payment required under subsection (5), pay to the Contractor an amount equal

(a) when a Labour and Material Payment Bond was required of and furnished by him, to ninety-five percent of the amount of progress claim, or

(b) when a security deposit was required of and furnished by him, to eighty-five percent of the amount of the progress claim.

4(7) Upon the expiration of sixty days from the date of issuance of an Interim Certificate of Completion under subsection 39(1) of the General Conditions or thirty days after the Contractor has delivered to the Owner an invoice approved by the Engineer-Architect, showing the method by which the amount claimed therein was calculated, whichever is the later date, and if the Contractor has made and delivered to the Owner his Statutory Declaration deposing or proof of payment, if required by the Owner, verifying the fact that all his lawful obligations to subcontractors, workmen and suppliers of material in respect of the work are fully discharged and that all other lawful claims against him in respect of the work including Workers' Compensation assessments have been satisfied or provided for, the amount described in section 1 as estimated by the Engineer-Architect less the aggregate of

(a) all payments made pursuant to subsection (6),

(b) an amount equal to double the estimated cost to the Owner of completing the items and doing the things described in the Interim Certificate of Completion which, in the opinion of the Engineer-Architect, are brought about by defects and faults in the work,

(c) an amount equal to double the cost to the Owner of completing the items and doing the things described in the Interim Certificate of Completion other than items or things to which paragraph (b) applies,

(d) all payments made pursuant to section 9, and

(c) all amounts retained pursuant to a maintenance and guarantee provision, if any, contained in the contract shall become due and be payable by the Owner to the Contractor.

4(8) Upon the expiration of sixty days from the date of issuance of the Final Certificate of Completion under subsection 39(2) of the General Conditions or thirty days after the Contractor has delivered to the Owner an invoice approved by the Engineer-Architect, showing the method by which the amount claimed therein was calculated, whichever is the later date, and if the Contractor has made and delivered to the Owner his Statutory Declaration or proof of payment, if required by the Owner, verifying the fact that all his lawful obligations and lawful claims against him, arising out of the work, have been discharged and satisfied, the amounts described in section 1 less the aggregate of

(a) all payments made pursuant to subsection (6),

(b) all payments made pursuant to subsection (7),

(c) all payments made pursuant to section 9, and

(d) all amounts retained pursuant to a maintenance and guarantee provision, if any, contained in the contract

shall become due and be payable by the Owner to the Contractor.

4(9) Where the Contractor does not provide the Owner with a Statutory Declaration or proof of payment required by subsection (5), (7) or (8) within the time limited therein, the Owner may withhold payment of the monies which would otherwise have become due until such time as the Statutory Declaration or proof of payment is provided by the Contractor to the Owner and the Owner during this period of time shall not be required to pay interest as provided for in section 6.

CLAIM PAYMENT NOT ACCEPTANCE

5 Neither a Progress Claim nor a payment by the Owner pursuant thereto shall be construed as evidence that the work, material or any part thereof is complete, is satisfactory or is in accordance with the contract.

OWNER'S DELAY IN PAYMENT

6 Delay by the owner in making a payment when it becomes due and is payable shall, if the delay continues for more than fifteen days, entitle the Contractor to interest on the overdue payment and the Owner shall pay to the Contractor interest thereon from the said fifteenth day until paid at the rate being charged by the Canadian chartered banks in Fredericton on prime commercial accounts as of the date from which such interest was payable.

OWNER'S RIGHT OF SET - OFF

7(1) Without restricting any right of set-off given or implied by law, the Owner may set-off against any amount payable to the Contractor under the contract, any amount payable to the Owner by the Contractor under this contract or under any current contract and, without restricting the generality of the foregoing, the Owner may when making payment pursuant to section 4 deduct from the amount payable any amount which is then payable to the Owner or the Province of New Brunswick by the Contractor under the contract or which, by virtue of the right of set-off, may be retained by the Owner.

7(2) For the purposes of this section "current contract" means

(a) a contract between the Owner and the Contractor under which the Contractor has an undischarged obligation to perform or supply work, labour or materials, or

(b) a contract between the Owner and the Contractor in respect of which the Owner has since the date on which this contract was entered into exercised the right to take the work, the subject of that contract, out of the Contractor's hands.

PAYMENT WHEN CONTRACT TERMINATED

8 In the event that the contract is terminated pursuant to section 19 of the General Conditions, the Owner shall as soon as is practicable under the circumstances pay to the Contractor the amount, if any, payable to the Contractor pursuant to that section.

INTERIM RELEASE OF HOLDBACK

9(1) The Owner may at any time, but not more than twice during the term of the contract, on the written application of the Contractor and with the approval of the surety, pay to the Contractor all, or a portion of, the percentage amounts retained up to that time in respect of payments on Progress Claims under subsection 4(6).

9(2) Subject to the approval of the surety, the making of any such payment, and the amount thereof, are wholly in the discretion of the Owner.

DEFINITION OF TERMS

1(1) In the documents forming the contract, unless the context otherwise requires:

"Engineer-Architect" means the ....
....
.........of..
....................and includes a person authorized by him to perform on his behalf any function under the contract;

"herein," "hereby," "hereof," "hereunder" and similar expressions refer to the contract as a whole and not to any particular subdivision or part thereof;

"material" includes all materials, commodities, articles and things required to be furnished under the contract for incorporation in the work;

"Owner" means that Minister, agency or corporation set forth in the Articles of Agreement as the Owner;

"plant" includes all animals, tools, implements, machinery, vehicles, buildings, structures, equipment, articles and things required for the execution of the work;

"security deposit" means the security given by the Contractor to the Owner in accordance with the contract;

"subcontractor" means a person, firm or corporation having a contract with the Contractor

(a) for the execution of a part or parts of the work included in this contract, or

(b) for the furnishing of material called for in this contract and worked to a special design according to the Plans and Specifications

provided such contract is made pursuant to section 4;

"superintendent" means the employee of the Contractor who is designated by the Contractor as being in full charge of the field operations of the Contractor for the purposes of the contract;

"work" includes all labour, material and services required, as shown or described in the contract, supplied and installed or erected complete at the place of building.

1(2) The marginal notes, if any, in the contract documents form no part of the contract but shall be deemed to be inserted for the convenience of reference only.

REFERENCES

1(3) Unless the context otherwise requires, where in a contract document reference is made to a section, subsection or paragraph, the reference is deemed to be a reference

(a) in the case of section, to a section in the contract document,

(b) in the case of a subsection, to a subsection of the section, and

(c) in the case of a paragraph, to a paragraph in the section or subsection,

in which the reference appears.

INTERPRETING DOCUMENTS

1(4) In interpreting the contract in the event of discrepancies or conflicts between anything in the Plans and Specifications and the General Conditions, the General Conditions shall govern.

1(5) In interpreting the Plans and Specifications:

(a) in the event of discrepancies or conflicts between the Plans and Specifications, the Specifications shall govern;

(b) in the event of discrepancies or conflicts between the Plans, the Plans drawn with the largest scale shall govern; and

(c) in the event of discrepancies or conflicts between figured dimensions and scaled dimensions, the figured dimensions shall govern.

CONTRACT BINDING

2 The contract shall inure to the benefit of and be binding upon the parties hereto and their heirs, executors, administrators, successors, and assigns.

ASSIGNMENT

3 The contract may not be assigned without the written consent of the Owner and until sections 51 and 52 of the Financial Administration Act, chapter F-11 of the Revised Statutes of New Brunswick, 1973, have been complied with where applicable.

SUBCONTRACTING

4(1) Except for the subcontracting proposed by the Contractor in his accepted tender, neither the whole nor any part of the work may be subcontracted by the Contractor without the consent of the Engineer-Architect.

4(2) Every subcontract by the Contractor, whether as proposed in the approved tender or as approved by the Engineer-Architect under subsection (1), shall provide that the subcontractor shall comply with all terms and conditions of this contract which can reasonably be applied to his undertaking including, without limiting the generality of the foregoing, the provisions of section 52.

SCOPE OF WORK

5(1) The description of the work and material set out in the contract includes not only the particular kind of work and material mentioned but also all labour, plant and material necessary for the full execution, completion and delivery ready for use of the work and material.

5(2) The Contractor shall provide everything necessary for execution of the work except things in respect of which the contract expressly provides otherwise and except the site of work if the work when completed is to remain permanently affixed thereon.

NO IMPLIED OBLIGATION

6 No implied obligation of any kind by or on behalf of the Owner shall arise from anything in the contract, and the express covenants and agreements herein contained and made by the Owner are and shall be the only covenants and agreements upon which any right against the Owner are to be founded, and, without limiting the generality of the foregoing, the contract supersedes all communications, negotiations and agreements, either written or oral, relating to the work and made prior to the date of the contract.

TIME OF THE ESSENCE

7 Time is of the essence of the contract.

INDEMNITY BY CONTRACTOR

8(1) Except as provided in section 9, the Contractor shall indemnify and save harmless the Owner from and against all claims, demands, losses, costs, damage, actions, suits, or proceedings by whomsoever made, brought or prosecuted in any manner based upon, arising out of, related to, occasioned by or attributable to the activities of the Contractor in executing the work under the contract or to an infringement or an alleged infringement by the Contractor of a patent of invention.

8(2) For the purposes of subsection (1), "activities" includes an act improperly carried out, an omission to carry out an act and delay in carrying out an act.

INDEMNITY BY OWNER

9 The Owner shall indemnify and save harmless the Contractor from and against all claims, demands, losses, costs, damage, actions, suits or proceedings arising out of his activities under the contract which are directly attributable to

(a) a lack of title, a defect in title or an alleged lack of title or defect in title to the site of the work, or

(b) an infringement or an alleged infringement of any patent of invention in executing anything for the purposes of the contract, the model, plan or design of which was supplied by the Owner to the Contractor.

ELECTED MEMBERS

10(1) No member of the Legislative Assembly of the Province of New Brunswick shall be admitted to any share or part of the contract or to any benefit arising therefrom.

10(2) No member of the House of Commons of Canada shall be admitted to any share or part of the contract or to any benefit arising therefrom if Government of Canada funds are involved, whether directly or indirectly, in the payment for or financing of such contract.

SERVING NOTICES

11(1) Notices for the purposes of paragraph 16(1)(a), section 18 and section 19 shall be in writing and shall

(a) be delivered to the Contractor in person, or, if the Contractor is a corporation or partnership, be delivered to the superintendent or to a senior administrative officer of the corporation or partnership, or

(b) be sent by mail to the Contractor or his superintendent addressed to the address mentioned in the contract,

and if any question arises as to when any such notice was given to or received by the Contractor it shall be deemed to have been sufficiently given to and received by him,

(c) if it was delivered pursuant to paragraph (a), on the day it was delivered, or

(d) if it was sent by mail pursuant to paragraph (b), on the day it was received by the Contractor or on the sixth day after it was mailed, whichever is the earlier.

11(2) Any notice, order, direction, decision or communication, other than a notice to which subsection (1) refers, which may be given to the Contractor pursuant to the contract may be given in any manner, but it shall be deemed to have been sufficiently given to the Contractor if it was put in writing and the writing was

(a) delivered to the Contractor in person, or, if the Contractor is a corporation or partnership, was delivered to the superintendent or to a senior administrative officer of the corporation or partnership,

(b) left at the Contractor's office, or, if he has more than one office, at one of them, or

(c) sent by mail to the Contractor or his superintendent addressed to the address mentioned in the contract or to the Contractor's last known place of business or residence.

ADJUSTMENTS DUE TO SOIL CONDITIONS, NEGLECT OR DELAY

12(1) No payment, in addition to the payment expressly promised by the contract, shall be made by the Owner to the Contractor on account of any extra expense, loss or damage incurred or sustained by the Contractor including a misunderstanding on the part of the Contractor as to any fact, whether or not such misunderstanding is attributable directly or indirectly to the Owner or any of the Owner's agents or servants, and whether or not any negligence or fraud on the part of the Owner's agents or servants is involved, unless, in the opinion of the Engineer-Architect the extra expense, loss or damage is directly attributable to

(a) a substantial difference between information relating to soil conditions at the site of the work, or a reasonable assumption of fact based thereon, in the Plans and

Specifications or other documents or material communicated by the Owner to the Contractor for his use in preparing his tender and the real soil conditions encountered at the site of the work by the Contractor when executing the work, or

(b) neglect or delay occurring after the date of the contract on the part of the Owner in providing any information or in doing any act which the contract either expressly requires the Owner to do or which would be done by an Owner in accordance with the usage of the trade to enable his Contractor to carry out an undertaking similar to the work being executed under the contract for the Owner,

in which case, if as a condition precedent the Contractor has given to the Engineer-Architect written notice of his claim before the expiration of thirty days from the encountering of the soil conditions giving rise to the claim or from the day on which the neglect occurs or the delay commences, as the case may be, the Owner shall pay to the Contractor, in respect of the additional expense, loss or damage incurred or sustained by reason of that difference, neglect or delay, an amount equal to the cost of the additional plant, labour and material necessarily involved.

12(2) If, in the opinion of the Engineer-Architect, the Contractor has effected a saving of expenditure by reason of the execution of the work by the Contractor being rendered less difficult and less costly because the soil conditions actually encountered by the Contractor at the site if the work when executing the work are substantially different from soil conditions indicated in information, or a reasonable assumption of fact based thereon, in the Plans and Specifications or other documents or material communicated by the Owner of the Contractor for his use in preparing his tender, the amount set out in Article II of the Articles of Agreement shall be reduced by an amount equal to the saving effected by the Contractor.

12(3) Paragraph (1)(a) and subsection (2) are applicable only to a fixed price arrangement.

12(4) If information relating to soil conditions at the site of the work appeared in the Plans and Specifications or in other documents or material communicated by the Owner to the Contractor for his use in preparing his tender and if the real soil conditions encountered at the site of the work by the Contractor when executing the work are substantially different from such information, or a reasonable assumption of fact based thereon, so that the cost to the Contractor of executing the work is directly and substantially increased or decreased by reason of such difference, the Engineer-Architect and the Contractor may by agreement in writing amend the price per unit for any class of plant, labour or material involved therein, so that the benefit of a substantial decrease in cost shall accrue to the Owner and the burden of a substantial increase in cost shall not be borne by the Contractor.

12(5) Subsection (4) is applicable only to a unit price arrangement.

12(6) No claim by the Contractor shall be valid in situations where subsection (4) is applicable unless he has given written notice thereof to the Owner within thirty days from the encountering of the soil conditions giving rise to such claim.

OWNER'S TITLE TO PLANT, ETC.

13(1) All material and plant and the interest of the Contractor in all real property, licences, powers and privileges acquired, used or provided by the Contractor for the work shall from the time of being so acquired, used or provided, become and they are the property of the Owner for the purposes of the work and they shall continue to be the property of the Owner

(a) in the case of material, until incorporated in the work or until the Engineer-Architect certifies that he is satisfied that it will not be required for the work, and

(b) in the case of plant, real property, licences, powers and privileges, until the Engineer-Architect certifies that he is satisfied that the interest vested in the Owner therein is no longer required for the purposes of the work.

13(2) Material or plant that is the property of the Owner by virtue of this section shall not be taken away from the site of the work, or used or disposed of, except for the purposes of the work, without the consent in writing of the Engineer-Architect.

13(3) The Owner is not liable for loss or damage to material or plant that is the property of the Owner by virtue of this section and the Contractor is liable for such loss or damage notwithstanding that the material or plant is the property of the Owner.

CONTRACTOR'S LIABILITY FOR DAMAGE TO OWNER'S PLANT

14(1) The Contractor is liable to the Owner for loss of or damage to material, plant or real property, whether attributable to causes beyond his control or not, supplied or made available by the Owner to the Contractor for use in connection with the work other than loss or damage resulting from and directly attributable to reasonable wear and tear.

14(2) The Contractor shall not use material, plant or real property to which this section applies except for the purpose of carrying out this contract.

14(3) When the Contractor has failed to make good any loss or damage for which he is liable under this section within a reasonable time after being required by the Engineer-Architect to do so, the Engineer-Architect may cause the loss of damage to be made good, and the Contractor shall thereupon be liable to the Owner for the cost thereof and shall on demand pay to the Owner an amount equal to such cost.

14(4) The Contractor shall keep such records of material, plant and real property to which this section applies as the Engineer-Architect from time to time requires and shall, from time to time as the Engineer-Architect requires, satisfy the Engineer-Architect that such material, plant and real property are at the place and in the condition that they ought to be.

EXTENSION OF TIME AND PENALTY FOR DELAY IN COMPLETION

15(1) The Engineer-Architect may, on the application of the Contractor if made in accordance with the time limits in subsection 33(2) and made before the day fixed by Article I of the Articles of Agreement for completion of the work or any specified portion thereof or before any new date for completion previously fixed under this subsection, if in his opinion it is in the public interest, extend the time for completion of the work or any specified portion or portions thereof by fixing a new day for such completion.

15(2) Where the Contractor does not complete the work or any specified portion thereof by the day fixed by Article I of the Articles of Agreement for such completion or by such subsequent day, if any, to which the time for completion has been extended under subsection (1), but does complete the work or portion thereafter, the Contractor shall pay to the Owner

(a) where no statutory penalty is provided by subsection (3),

(i) an amount equal to all salaries, wages and travelling expenses paid by the Owner to persons superintending the work during the period of delay, which would not otherwise have been payable,

(ii) an amount equal to the value to the Owner of the use of the completed work for the period of delay, and

(iii) an amount equal to all other expenses and damages incurred or sustained by the Owner as a result of the work or specified portion thereof not being completed during the period of delay, or

(b) where a statutory penalty is provided for by subsection (3), the amount prescribed therein for each day the work or specified portion therefor was not complete during the period of delay.

15(3) (a) The Contractor shall pay to the Owner

(i) for each day of the period of delay during which the work in its entirety is not complete, the sum of ...., and

(ii) for each day of the period of delay during which the following specified portions of the work are not complete, the sum stated for such portion

(A) ....

(B) ....

(C) ....

(b) Where no penalty is stipulated in paragraph (a), the Contractor is not bound by this subsection.

15(4) For the purposes of this section,

(a) the work is deemed to be completed on the day specified by the Engineer-Architect in his Interim Certificate of Completion, and

(b) "period of delay" means the period commencing on the day fixed by Article I of the Articles of Agreement for completion of the work or any portion thereof or such subsequent day, if any, to which the time for completion has been extended under subsection (1) and ending on the day immediately preceding the day on which the work or portion thereof is completed.

15(5) The Engineer-Architect may waive the right of the Owner to the whole or any part of a payment payable pursuant to subsection (2).

DEFAULT OR REMOVAL OF WORK FROM CONTRACTOR

16(1) In any of the following cases, namely,

(a) where the Contractor has made default or delayed in commencing or in diligently executing the work or any portion thereof to the satisfaction of the Engineer-Architect and the Engineer-Architect has given notice thereof to the Contractor and has by such notice required the Contractor to put an end to such default or delay and such default or delay continues for six days after such notice was given,

(b) where the Contractor has made default in the completion of the work, or any portion thereof, within the time limited for such completion by the contract,

(c) where the Contractor has become insolvent,

(d) where the Contractor has committed an act of bankruptcy,

(e) where the Contractor has abandoned the work,

(f) where the Contractor has made an assignment of the contract without the required consent, or

(g) where the Contractor has otherwise failed to observe or perform any of the provisions of the contract,

the Owner may, without any other authorization, take all or any portion of the work out of the Contractor's hands and may employ such means as he may see fit to complete the work.

16(2) Where the work or any portion thereof has been taken out of the Contractor's hands under subsection (1), the Contractor shall not, except as provided in subsection (3), be entitled to any further payment in respect of the work so affected including payments then due and payable but not paid, and the obligation of the Owner to make payments in respect thereof as provided for in the Terms of Payment shall be at an end with respect to that portion of the work taken out of his hands, and the Contractor shall be liable to and upon demand therefor shall pay to the Owner an amount equal to all loss and damage suffered by the Owner by reason of the non-completion of the work by the Contractor.

16(3) Where the work or any portion thereof has been taken out of the Contractor's hands under subsection (1) and is subsequently completed by the Owner, the Engineer-Architect shall thereafter determine the amount, if any, of holdback and progress claims of the Contractor in respect thereof unpaid at the time of taking the work out of the Contractor's hands that in his opinion are not required by the Owner for the purposes of the contract and the Engineer-Architect shall, if he is of the opinion that no financial prejudice to the Owner will result, authorise payment of the amount to the Contractor.

CONTRACTOR'S CONTINUING OBLIGATION

17(1) The taking of the work, or any portion thereof, out of the Contractor's hands pursuant to section 16 does not relieve or discharge the Contractor from any obligation under the contract or imposed upon him by law except the obligation under the contract to complete the physical execution of that portion of the work so taken out of his hands.

17(2) If the work or any portion thereof is taken out of the Contractor's hands pursuant to section 16, all material and plant and the interest of the Contractor in all real property, licences, powers and privileges acquired, used or provided by the Contractor for the purpose of the work shall, notwithstanding subsection 13(1), be the property of the Owner without compensation to the Contractor.

17(3) If the Engineer-Architect certifies that any property interest of the Owner by virtue of subsection (2) is no longer required for the purposes of the work and that it is not in the interests of the Owner to retain the interest, it shall revert to the Contractor subject to the provisions of subsection 13(3).

SUSPENSION OF WORK

18(1) The Engineer-Architect may require the Contractor to suspend execution of the work either for a specified or unspecified period by giving notice to that effect to the Contractor.

18(2) The Contractor upon receiving notice of the Owner's requirement pursuant to subsection (1) shall suspend all operations except those which, in the Engineer-Architect's opinion, are necessary for the care and preservation of the work, material and plant.

18(3) During the period of suspension the Contractor shall not remove from the site any part of the work, any material or any plant without the consent of the Engineer-Architect.

18(4) If the period of suspension is thirty days or less, the Contractor, upon the expiration of the period of suspension, shall resume the execution of the work and except where the suspension order was due to the Contractor not diligently prosecuting the work or failing to prosecute the work in a good and workmanlike manner he is entitled to be paid the cost of any plant, labour and material necessary involved in complying with the suspension.

18(5) If the period of suspension is more than thirty days and if, upon the expiration of the period of suspension, the Engineer-Architect and the Contractor agree that the execution of the work be completed by the Contractor, the Contractor shall resume operations and complete the execution of the work in accordance with any terms and conditions agreed upon by the Engineer-Architect and the Contractor.

18(6) If upon the expiration of a period of suspension of more than thirty days, the Engineer-Architect and the Contractor do not agree that the work will be completed by the Contractor or they are unable to agree upon the terms and conditions under which the Contractor will complete the work, the notice of suspension shall be deemed to be a notice of termination pursuant to section 19.

TERMINATION OF CONTRACT

19(1) The Owner may at any time by giving notice to that effect terminate the contract.

19(2) The Contractor shall upon receipt of a notice pursuant to subsection (1) cease all operations forthwith.

19(3) If the contract is terminated pursuant to subsection (1), the Owner shall pay to the Contractor an amount equal to the lesser of

(a) the value as agreed upon by the Contractor and the Engineer-Architect of all work performed by the Contractor as of the date of termination or, if the Contractor and the Engineer-Architect cannot agree, as calculated in accordance with the formula set out in section 45, less all amounts already paid to the Contractor by the Owner and less all amounts which the Contractor is liable to pay to the Owner, and

(b) the amount calculated in accordance with the terms of payment which would have been payable to the Contractor had he completed the work.

19(4) If the contract is terminated pursuant to subsection (1), the Owner shall pay to the Contractor an amount equal to the value as agreed upon by the Contractor and the Engineer-Architect of all work performed by the Contractor as of the date of termination or, if the Contractor and the Engineer-Architect cannot agree, as calculated in accordance with the formula set out in section 45, less all amounts already paid to the Contractor by the Owner and less all the amounts which the Contractor is liable to pay to the Owner.

19(5) Subsection (3) is applicable only to a fixed price arrangement and subsection (4) is applicable only to a unit price arrangement.

PAYMENT BY OWNER OF CONTRACTING OBLIGATIONS

20(1) The Owner may, in order to discharge lawful obligations of and satisfy lawful claims against the Contractor or a subcontractor arising out of the execution of the work, pay an amount which is due and payable to the Contractor, under any provision of the contract, directly to the obligees of and the claimants against the Contractor or the subcontractor.

20(2) A payment made pursuant to subsection (1) is to the extent of the payment a discharge of the Owner's liability under the contract to the Contractor.

20(3) The Contractor shall discharge all his lawful obligations and shall satisfy all lawful claims against him arising out of the execution of the work as the same become due.

20(4) The Contractor shall, whenever so requested by the Engineer-Architect, make a statutory declaration deposing to the existence and condition of the obligations and claims referred to in subsection (3).

ACCESS TO WORK BY OWNER

21 The Contractor shall permit the Engineer-Architect to have access to the work and to all areas where portions of the work are being fabricated or manufactured at all times during the execution of the work, shall provide the Engineer-Architect with full information concerning what is being done to execute the work and shall give the Engineer-Architect every possible assistance in respect of the performance of his duty to see that the work is executed in accordance with the contract and also in respect of the performance and exercise of the duties and powers specially imposed or conferred on him by the contract.

CLEAN UP

22 The Contractor shall upon completion of the work clear and clean the work and its site to the satisfaction of and in accordance with any directions of the Engineer-Architect.

CONTRACTOR'S SUPERINTENDENT

23(1) The Contractor shall, during working hours, until the work has been completed, keep on the site of the work a competent superintendent who has authority to receive on behalf of the Contractor any order, direction or other communication that may be given under the contract.

23(2) The Contractor shall, upon the request of the Engineer-Architect, remove any superintendent who, in the opinion of the Engineer-Architect, is incompetent or has been conducting himself improperly and shall replace a superintendent so removed with another superintendent as described in subsection (1).

REMOVAL OF CONTRACTOR'S EMPLOYEES

24 The Contractor shall, at the request of the Engineer-Architect, remove from the work any person employed on the work who, in the opinion of the Engineer-Architect, is incompetent or has been conducting himself improperly and the Contractor shall not permit a person so removed to remain on the site of the work.

ESCALATION - LABOUR - MATERIAL

25(1) Except where the Labour Conditions contain an escalation clause, the amount payable to the Contractor under the contract shall not be increased or decreased by reason of any increase or decrease in the cost of the work brought about by an increase or decrease pursuant to the Labour Conditions.

25(2) Notwithstanding section 12 and subsection (1) of this section, the amount set out in Article II of the Articles of Agreement shall be adjusted, in the manner provided in subsection (3), in the event of any change in any tax imposed under the Social Services and Education Tax Act, chapter S-10 of the Revised Statutes of New Brunswick, 1973, or the Excise Tax Act, chapter E-13 of the Revised Statutes of Canada, 1970,

(a) after the date of the submission by the Contractor of the tender for the contract, and

(b) that applies to the material incorporated or to be incorporated in the work and that affects the cost to the Contractor of such material.

25(3) In the event of any change after the date of submission of the tender for the contract by the Contractor in any tax described in subsection (2) that applies to the material incorporated or to be incorporated in the work and that affects the cost to the Contractor of such material, the amount set out in Article II of the Articles of Agreement shall

(a) be increased where the cost to the Contractor of any material has been increased by virtue of the change, or

(b) be decreased where the cost to the Contractor of any material has been decreased by virtue of the change.

by an amount equal to such amount as it is established upon examination of the relevant records of the Contractor referred to in section 47, represents the increase or decrease, as the case may be, in the cost to the Contractor of the material involved that is directly attributable to the change in the tax levied on or in respect of such material.

25(4) For the purpose of determining the adjustment in the amount set out in Article II of the Articles of Agreement by virtue of any change in any tax described in subsection (2), where such tax is changed after the date of submission of the tender by the Contractor but public notice of such change has been given by the Minister of Finance of the Province or the Federal Government, as the case may be, before the date of submission of the tender, the change of such tax shall, for the purposes of this section, be deemed to have occurred before the date of submission of the tender.

25(5) The Contractor is not entitled to any part of a rebate of taxes obtained by the Owner.

USE OF LOCAL LABOUR AND MATERIAL

26(1) The Contractor shall use Canadian labour and material in carrying out the work, to the full extent to which they are procurable, consistent with proper economy and the expeditious carrying out of the work.

26(2) Subject to subsection (1), the Contractor shall employ labour and obtain material from the locality where the work is being executed to the extent to which it is available and shall use the offices of the Canada Employment Centre in the recruitment of workmen wherever practicable.

26(3) Subject to subsections (1) and (2), the Contractor shall employ a reasonable proportion of persons who have served on active service with the armed forces of Canada and have been honourably discharged therefrom.

SAFETY

27(1) If, in the opinion of the Engineer-Architect, the Contractor is not conducting construction of the work with proper safety precautions for workmen as prescribed by the Occupational Health and Safety Regulation - Occupational Health and Safety Act, the Engineer-Architect may, by giving notice in writing to the Contractor, stop the work.

27(2) Where under subsection (1) the Engineer-Architect has stopped the work, the Contractor shall immediately cease his operations until the provisions of the Occupational Health and Safety Regulation - Occupational Health and Safety Act have been complied with to the satisfaction of the Engineer-Architect.

27(3) No extension of time or monetary allowances shall be made to the Contractor for loss or delay arising from any stoppages in work under this section.

PROTECTION OF WORK

28 The Contractor shall guard or otherwise protect the work and shall protect the specifications, plans, drawings, information, material, plant and real property provided by the Owner to the Contractor against loss or damage from any cause.

PUBLIC CEREMONIES

29(1) The Contractor shall not allow or permit any public ceremony in connection with the work without the permission of the Owner.

29(2) The Contractor shall not erect or permit the erection of any sign or advertising on the work without the approval of the Engineer-Architect.

INSURANCE

30(1) The Contractor shall at his own expense maintain such insurance policies, if any, as are required under this contract in a form and with companies approved by the Owner and of the nature, in the amounts, for the periods and containing the terms and conditions, if any, set out in the Insurance Schedule.

30(2) All insurance policies covering the work and maintained by the Contractor pursuant to subsection (1) shall provide that the proceeds thereof are payable to the Owner, except where the Insurance Schedule otherwise provides.

30(3) The Contractor shall deposit with the Engineer-Architect the originals of all policies of insurance maintained by the Contractor pursuant to subsection (1) and the Contractor shall, when required by the Engineer-Architect, submit to him proof that such policies are in force.

30(4) Upon application by the Contractor, the Engineer-Architect may waive compliance with subsections (2) and (3).

FIRE LOSS

31(1) If the work or any portion thereof is lost or destroyed and monies are paid to the Owner in respects of the loss or damage under a policy of insurance maintained by the Contractor pursuant to section 30, the monies shall be held by the Owner for the purposes of the contract.

31(2) The Owner may elect to retain absolutely the monies held under subsection (1) and, in such event, the monies belong absolutely to the Owner and

(a) the Contractor is liable to the Owner in an amount equal to the amount by which the insurance monies payable is less than the loss and damages suffered and sustained by the Owner, including costs associated with clearing and cleaning the site of the work, and

(b) there shall be a financial accounting between the Owner and the Contractor in respect of the portion of the work which was lost or damaged and respect of which monies have been retained absolutely by the Owner and there shall be included in the financial accounting all amounts paid or payable by the Owner under the contract to the Contractor, together with all amounts paid or payable by the Contractor under the contract to the Owner and the Owner shall pay to the Contractor any balance.

31(3) Upon payment as required by subsection (2) by the Owner or the Contractor as the case may be, the Owner and the Contractor are discharged from all rights and obligations under the Contract in respect of the portion of the work which was lost or damaged and in respect of which monies have been retained absolutely by the Owner as though such portion of the work had been fully completed and executed by the Contractor in accordance with the contract.

31(4) If an election is not made under subsection (2), the Contractor shall restore and replace the portion of the work lost or damaged and the insurance monies shall be disbursed by the Owner to the Contractor in the manner and subject to the terms and conditions governing monies payable under the contract to the Contractor by the Owner, except that for the purpose of this subsection "one hundred percent" shall be substituted in subsection 4(6) of the Terms of Payment for "ninety-five percent" and "eighty-five percent".

CONTRACTOR'S RESPONSIBILITIES

32(1) The Contractor shall at his own expense do whatever is necessary to ensure that

(a) no person, property, right, easement or privilege is injured, damaged or infringed by reason of the Contractor's activities under this contract,

(b) pedestrian and other traffic on any public or private road or waterway is not unduly impeded, interrupted or endangered by the execution or existence of the work and plant,

(c) fire hazards are eliminated and in the case of a fire in or about the work that it is promptly extinguished,

(d) the health of all persons employed on the work is not endangered,

(e) adequate medical supervision of all persons employed on the work is maintained,

(f) adequate sanitation measures in respect of the work are taken, and

(g) all stakes, buoys, lines, levels, and marks placed on or about the works by or under the authority of the Engineer-Architect are protected and are not removed, defaced or altered.

32(2) The Engineer-Architect may direct the Contractor to do such things and to construct such works which the Engineer-Architect considers reasonable and necessary to ensure compliance with or to remedy a breach of subsection (1).

32(3) The Contractor shall at his own expense comply with a direction of the Engineer-Architect made pursuant to subsection (2).

INTERPRETATIONS OF CONTRACT DOCUMENTS - CLAIMS ARISING

33(1) If at any time before the work has been completed and the Engineer-Architect has issued his Final Certificate of Completion, any question arises as to whether anything has been done as required by the contract or as to what the Contractor is required by the contract to do, and in particular, and without limiting the generality of the foregoing, as to

(a) the meaning of anything in the Plans and Specifications,

(b) the meaning to be given to the Plans and Specifications in case of any error therein, an omission therefrom, or an obscurity or discrepancy in the wording or intention thereof,

(c) whether the quality or quantity of any material or workmanship meets the requirements of the contract,

(d) whether the plant, material or workmen provided by the Contractor for executing the work and carrying out the contract are adequate to ensure that the work will be executed in accordance with the contract and that the contract will be carried out in accordance with its terms,

(e) what quantity of any kind of work has been completed by the Contractor, or

(f) the timing and scheduling of the various phases of the execution of the work,

the question shall be decided by the Engineer-Architect whose decision is final and binding.

33(2) In matters arising other than under section 12, the Contractor shall, where he intends to submit a claim for additional time or money arising out of the construction of the work, give written notice of his intention to claim

(a) in the case of changes or alterations of the work ordered by the Engineer-Architect, within fourteen days of receipt of the notice of change, and

(b) in the case of a dispute arising out of interpretation of the contract, within thirty days of the first occurrence of the circumstances giving rise to the dispute.

33(3) In matters arising other than under section 12, the Contractor may submit a claim for additional time or money only on those matters covered by the notice of intention to claim given under subsection (2) and such claim if not submitted within thirty days of the occurrence of the portion of the work out of which the claim arises shall be barred.

33(4) The Engineer-Architect shall within thirty days of receipt of a notice of claim under this section render his decision in writing to the Contractor.

33(5) The Contractor shall construct the work in accordance with the decisions and directions of the Engineer-Architect given under this section and in accordance with any consequential decisions and directions given by the Engineer-Architect.

DEFECTS AND OMISSIONS

34(1) Without restricting any warranty or guarantee implied or stipulated by law, the Contractor shall at his own expense rectify and make good any defect or fault or omission that appears in the work within twelve months or within such additional period of time stipulated in the Specifications concerning particular portions of the work from the date of the Engineer-Architect's Final Certificate of Completion, or where an Interim Certificate of Completion has been issued under section 39, from the date of such Interim Certificate.

34(2) If any defect, fault or omission appears in the work and the Engineer-Architect is of the opinion that it is one which the Contractor, either under subsection (1) or under a warranty or guarantee implied or stipulated by law, is obliged to remedy and make good, the Engineer-Architect may direct the Contractor to remedy and make good the defect, fault or omission by giving notice to the Contractor of the existence of the defect, fault or omission and the notice shall specify the time within which the defect, fault, or omission is to be rectified and made good.

34(3) The Contractor shall rectify and make good the defect, fault or omission described in a notice given pursuant to subsection (2) within the time specified in the notice.

OWNER'S RIGHT TO COMPLETE WORK

35(1) Where the Contractor has failed to comply with any decision or direction given by the Engineer-Architect under section 22, 32, 33, or 34, the Engineer-Architect may employ such methods as he may deem expedient to do that which the Contractor failed to do.

35(2) The Contractor shall on demand pay to the Owner all costs, expenses and damages incurred or sustained by the Owner by reason of the Contractor's non-compliance with any decision or direction given by the Engineer-Architect under this section 22, 32, 33, or 34 and by the action taken by the Engineer-Architect pursuant to subsection (1).

CONTRACTOR'S RIGHTS ON DISPUTED DECISION

36 If the Contractor has, within ten days of communication to him by the Engineer-Architect of any decision or direction of the Engineer-Architect under section 22, 32, 33, or 34, given notice to the Engineer-Architect in writing disputing such decision or direction and stating the ground or grounds which form the basis of such dispute, the Owner shall pay to the Contractor the cost of the additional labour, material and plant necessarily involved in carrying out the decision or direction beyond what the Contract, correctly understood and interpreted, would have required the Contractor to do.

CHANGES IN THE WORK

37(1) The Engineer-Architect may at any time before he issues his Final Certificate of Completion, in writing,

(a) order work or material in addition to that provided for in the Plans and Specifications, and

(b) delete work or change the dimensions, nature, character, quantity, quality, description, location or position of the whole or any part of the work or material provided for in the Plans and Specifications or as ordered pursuant to paragraph (a),

and the Contractor shall execute the work in accordance with such orders, deletions, and changes as if the same had appeared in and been part of the Plans and Specifications.

37(2) The Engineer-Architect shall determine whether anything done or not done by the Contractor pursuant to an order, deletion or change made by the Engineer-Architect pursuant to subsection (1) increased or decreased the cost of the work to the Contractor.

37(3) If the Engineer-Architect determines under subsection (2) that the cost has been increased, the Owner shall pay to the Contractor the cost of the additional labour, material and plant necessarily involved.

37(4) If the Engineer-Architect determines under subsection (2), that the cost has been decreased, the Owner may reduce the amount payable to the Contractor under the contract by the amount equal to the reduction in cost of the labour, material and plant involved.

37(5) Where provision for the calculation of increased and decreased cost under subsections (3) and (4) is contained in the Contract Documents, such cost shall be calculated in accordance therewith.

RELATIONS WITH OTHER CONTRACTORS

38(1) Wherever work being done by the Owner's forces or by other contractors is contiguous to work covered by this contract, the respective rights of the various interests involved shall be established by the Engineer-Architect to secure the completion of the various portions of the work in general harmony.

38(2) The Owner reserves the right to let other contracts in connection with this project and the Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their material and the execution of their work and shall properly connect and co-ordinate his work with theirs.

38(3) If any part of the Contractor's work depends for proper execution or results upon the work of any other contractor, the Contractor shall inspect and promptly report to the Engineer-Architect any defects in such work that render it unsuitable for such proper execution or results and his failure so to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his work except as to defects which may develop in the other contractor's work after the execution of this work.

38(4) To insure the proper execution of his subsequent work, the Contractor shall measure work already in place and shall at once report to the Engineer-Architect any discrepancy between the executed work and the drawings.

INTERIM CERTIFICATE OF COMPLETION

39(1) If the Engineer-Architect is satisfied that the work is substantially completed and is acceptable for use by the Owner, he may at any time before issuance of a Final Certificate of Completion issue to the Contractor an Interim Certificate of Completion, and shall describe therein the portions of the work not completed to his satisfaction, state those quantities which require additional measurements and all things which must be done by the Contractor before a Final Certificate of Completion can be issued.

39(2) As soon as reasonably possible after

(a) the work has been completed, and

(b) the Contractor has complied with the contract and all orders and directions made pursuant thereto,

to the satisfaction of the Engineer-Architect, he shall issue to the Contractor a Final Certificate of Completion.

39(3) The Engineer-Architect, before issuing a Final Certificate of Completion, may, in addition to the matter described in the Interim Certificate of Completion, require the Contractor to rectify any other portions of the work not completed to the satisfaction of the Engineer-Architect and to do any other things necessary for the completion of the work.

39(4) The Engineer-Architect shall measure and keep records of his measurements of the quantities of labour, material and plant performed, used and supplied by the Contractor in executing the work and shall, at the request of the Contractor, inform him of his measurements and the Contractor shall assist and co-operate with the Engineer-Architect in such measuring and is entitled to inspect the records of measurements kept by the Engineer-Architect.

39(5) On the day that the Engineer-Architect issues his Final Certificate of Completion under subsection (2), he shall issue a Final Certificate of Measurement showing the quantity of labour, plant and material performed, used and supplied by the Contractor in executing the work and all measurements included therein shall be binding upon the Owner and the Contractor and are exclusive between them as to the quantity of any labour, plant or material performed, used or supplied by the Contractor in executing the work.

39(6) Subsections (4) and (5) are applicable only to a unit price arrangement.

CONVERSION OF SECURITY DEPOSIT

40(1) If the work is taken out of the Contractor's hands pursuant to section 16 or if the contract is terminated pursuant to section 19 or if the Contractor is in breach of or in default under the contract, the Owner may negotiate the security deposit, in the case of bonds, or convert the security deposit to the Owner's own use, in the case of money, and the amount realized by the Owner shall be deemed to be a debt by the Owner to the Contractor and the Owner shall have the right of set-off and may set-off against the debt any sum or amount which the Contractor may be liable to pay to the Owner and the balance of the debt, if any, after the right of set-off has been exercised, shall if such balance, in the opinion of the Engineer-Architect, is not required for the purpose of the contract and subject always to the provisions of section 20 be paid by the Owner to the Contractor.

40(2) The Owner may retain for the purpose of the contract any balance of moneys, otherwise payable to the Contractor under subsection (1).

RETURN OF SECURITY DEPOSIT

41(1) Upon the Engineer-Architect's Interim Certificate of Completion being issued, the Owner shall, if the Contractor is not in breach of or in default under the contract, return to the Contractor that part of the security deposit covering performance of the work which, in the opinion of the Engineer-Architect, is not required for the purposes of the contract.

41(2) Where the security deposit was converted to cash, the Owner shall pay to the Contractor the interest accrued thereon to the date of payment to the Contractor, but in no case shall the interest payable by the Owner exceed the amount paid to the owner thereon as a result of the Owner complying with subsection 20(2) of the General Regulation - Crown Construction Contracts Act and in no case shall interest be paid by the Owner to the Contractor on that portion of the security deposit taken or used by the Owner in accordance with the provisions of this Agreement.

PERMITS AND LICENCES

42(1) The Owner shall furnish all surveys unless otherwise specified.

42(2) Permits and licences of a temporary nature normally required for the prosecution of the work shall be secured and paid for by the Contractor.

42(3) Easements or other authorizations for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner unless otherwise specified.

42(4) No extension of time for completion of the work shall be allowed due to delay for any cause in the obtaining by the Contractor of the licences and permits described in subsection (1), (2), or (3) except where such delay is the direct result of actions of the Owner.

DETERMINATION OF COST - UNIT PRICE

43 Whenever it is necessary for the purposes of sections 12, 18, 36 and 37 to determine the cost of labour, plant or material, the Unit Price Table shall be used, that is, the cost shall be equal to the product of the agreed quantity of such labour, plant or material expressed in the appropriate unit of measurement multiplied by the price in respect of such unit.

DETERMINATION OF COST - AGREEMENT

44 If the method of determination in section 43 cannot be used because the labour, plant or material involved is not included in the Unit Price Table, the cost of the labour, plant or material for the purposes of sections 12, 18, 36 and 37 shall be the amount agreed upon from time to time by the Contractor and the Engineer-Architect.

DETERMINATION OF COST - COST PLUS

45(1) Where the method of determination provided for in section 43 cannot be used and the Engineer-Architect and Contractor do not agree as provided in section 44, the Owner and the Contractor may, by an agreement in writing, agree to determine the cost of labour, plant or material for the purposes of section 12, 18, 36 and 37 to be equal to the aggregate of

(a) all reasonable and proper amounts actually expended by or legally payable by the Contractor in respect of the labour, plant or material which fall within any of the classes of expenditure described in subsection (2) (being costs which are directly attributable to the execution of the work and are not costs in respect of which the allowance in paragraph (b) is made), and

(b) fifteen percent of the total of the expenditures of the Contractor that meet the test in paragraph (a), as an allowance for all other expenditures by the Contractor and for profit, and without limiting the generality of the foregoing, being also an allowance for payments and charges relating to overhead, head office expenses and general administration costs of the Contractor, including finance and interest charges, or, five percent of such expenditures where the Contractor has the work done by a subcontractor: provided that such allowance shall not be applied to any portion of the expenditures identified under paragraph (2)(h) in which the Machine Rental Regulation - Crown Construction Contracts Act is used to calculate such expenditure; but where the cost determination arises solely out of a change order issued pursuant to section 37 and the value of that change order, as estimated by the Engineer-Architect at the time of its issue, is $2,500 or less, then twenty percent of the total of the expenditures of the Contractor that meet the test in paragraph (a), as an allowance for all other expenditures by the Contractor and for profit, and without limiting the generality of the foregoing, being also an allowance for payments and charges relating to overhead, head office expenses and general administration costs of the Contractor, including finance and interest charges, or, ten percent of such expenditures where the Contractor has the work done by a subcontractor: provided that such allowance shall not be applied to any portion of the expenditures identified under paragraph (2)(h) in which the Machine Rental Regulation - Crown Construction Contracts Act is used to calculate such expenditure.

45(2) Classes of expenditure that are allowable are:

(a) payments to subcontractors, agreed to by the Owner;

(b) wages, salaries and travelling expenses of employees of the Contractor while they are actually and properly engaged on the work, other than wages, salaries, bonuses, living and travelling expenses, of personnel of the Contractor generally employed at the head office or at a general office of the Contractor unless such personnel is engaged at the site of the work with the approval of the Engineer-Architect;

(c) payments for material necessary for and incorporated in the work, or necessary for and consumed in the execution of the work;

(d) payments for consumable tools, other than tools customarily provided by tradesmen, necessary for and used in the execution of the work;

(e) payments for preparation, inspection, delivery, installation and removal of material necessary for the execution of the work;

(f) payments for renting, erecting, maintaining, and removing temporary offices, sheds and similar structures necessary for and used by the Contractor in executing the work;

(g) assessments in respect to the work payable under any statutory requirement or other agreements relating to payroll burdens;

(h) payments for renting plant and allowances for plant owned by the Contractor necessarily for the execution of the work providing that such payments or allowances are reasonable and do not exceed the equipment rental rate set out in the Machine Rental Regulation - Crown Construction Contracts Act;

(i) payments for inspection, delivery, installation and removal of plant necessary for the execution of the work; and

(j) other payments made with the approval of the Engineer-Architect that are necessary for the execution of the work.

DEFINITION OR DETERMINATION OF COST

46(1) For the purposes of sections 44 and 45 and except as in those sections specifically provided, plant does not include tools.

46(2) For the purposes of sections 43, 44 and 45, "Unit Price Table" means the table referred to in Article VI of the Articles of Agreement.

MAINTAIN RECORDS BY CONTRACTOR

47(1) The Contractor and each subcontractor shall maintain

(a) the detail of the compilation of his estimate showing labour, material, plant, overhead and all other elements entering into his unit or lump sum prices as prepared for the purpose of tender, and

(b) full records of the actual cost to him of the work together with all proper tender calls, quotations, contracts, correspondence, invoices, receipts and vouchers relating thereto,

and shall make them available to audit and inspection by the Owner, the Comptroller of the Province of New Brunswick, or by persons acting on their behalf, shall allow them to make copies thereof and to take extracts therefrom, and shall furnish them with any information which they may require from time to time in connection with such records.

47(2) The records maintained by the Contractor and each subcontractor pursuant to this section shall be kept intact until the expiration of two years from the date of issuance of the Final Certificate of Completion under subsection 39(2) or until the expiration of such other period as the Owner may direct.

47(3) The Contractor shall require all subcontractors and all firms, corporations and persons directly or indirectly controlled by or affiliated with the Contractor and all firms, corporations and persons directly or indirectly having control of the Contractor to comply with subsections (1) and (2) as if they were the Contractor.

WORK SCHEDULE

48(1) Except as otherwise provided in the Contract Documents, the Contractor shall submit to the Engineer-Architect within thirty days of the formal notice of award of contract a work schedule satisfactory to the Engineer-Architect showing therein the time, rate, and order of construction he proposes for the various portions of the work.

48(2) No progress claims shall be paid by the Owner during the time while the Contractor is in default under subsection (1).

COST BREAKDOWN OF LUMP SUM WORK

49 The Contractor shall, on contracts which are wholly lump sum or partly lump sum and partly unit price, submit a schedule to the Owner showing the cost breakdown of the lump sum work to assist the Engineer-Architect in assessing progress claims.

CONTRACTOR'S JOB OFFICE

50(1) The Contractor shall provide a temporary weather tight job office, located in an area approved by the Engineer-Architect, for his own use complete with facilities for filing drawings, specifications, correspondence, purchase orders and such other appurtenances as are necessary for the proper conduct of the work and shall remove same upon completion of the work.

50(2) The Contractor shall provide a telephone in the job office described in subsection (1) where practicable.

50(3) The Contractor shall at all times during construction of the work maintain in the job office required by subsection (1) a complete and current set of plans, specifications and change orders for this contract.

RECORD OF IMPORTED PLANT

51 The Contractor shall deliver to the Engineer-Architect each time a Progress Claim is submitted a statement, signed by a responsible person on behalf of the Contractor, setting forth an accurate record of the serial number, type and date of arrival in the Province of all construction equipment brought into the Province and used during the immediately preceding Payment Period in performance of the work, the arrival of which had not been previously reported, together with the date of departure from the Province of any such equipment which had been so used.

COPY PURCHASE ORDERS

52(1) Where the accepted tender for the construction of the work exceeds fifty thousand dollars, the Contractor shall maintain on the construction site one copy of every purchase order used in acquiring services and material for incorporation into the work of this contract and allow the Engineer-Architect or his authorized representative access thereto.

52(2) A copy of each purchase order shall be made available to the Engineer-Architect at the job site prior to incorporation of the material purchased thereby into the work.

ARBITRATION

53(1) Any claim or dispute involving the Owner and the Contractor may, by mutual agreement of the parties, be submitted to arbitration.

53(2) Should the Owner in accordance with this section agree to enter into an Agreement to Arbitrate, the Agreement shall be limited to matters contained in the claim submitted by the Contractor and shall stipulate that the arbitration is not binding on either party.

E

This document is the document referred to as "Insurance Schedule" and marked "E" in the Articles of Agreement entered into on the .... day of .... 20........ between the Owner and the Contractor.

{ **DEPARTMENT OF TRANSPORTATION**
{
{
{
Signed { ______________________________
{ Owner
{
{
{
{ ______________________________
{ Contractor

INSURANCE SCHEDULE

General Items

1) The Contractor shall at his own expense, procure and maintain insurance policies which shall include the endorsements and extensions as detailed below.

2) The Contractor shall provide the Department with proof of coverage in the form of a certificate issued by Workplace Health, Safety and Compensation Commission (WHSCC) of New Brunswick identifying the contractor as registered and in good standing with WHSCC. Such proof of coverage will be provided to the Department in conjunction with the execution of the contract as well as is stipulated under the Terms of Payment A of the contract.

3) The Contractor shall provide to the Department of Transportation a Confirmation of Coverage as required by the Department which shall be signed by an authorized representative of the Insurer.

Part A - Course of Construction

The Insurance Policy required under this Part A shall include:

- a) a limit of coverage equal to 100% of the value of the Structure(s)
- b) Broad Form coverage including Flood and Earthquake
- c) a Replacement Cost basis of settlement
- d) all designated parties as Loss Payees
- e) a Waiver of Subrogation
- f) coverage for "By-laws"
- g) a 30 day notice provision
- h) resultant damage coverage

All as detailed on the Department's
Confirmation of Coverage form.

continued ...

Part B - Commercial General Liability

The Insurance policy required under this Part B shall include:

a) an "occurrence" definition of "accident"

b) the Province as an Additional Insured

c) Owners and Contractors Protective Liability

d) a Cross Liability clause

e) a waiver of subrogation

f) Blanket Contractual Liability

g) Products/Completed Operations Liability

h) Broad Form Property Damage

i) Non-owned Automobile Liability

j) Contingent Employers Liability

k) Personal Injury extension of Bodily Injury

l) coverage for machinery attached to vehicles

m) a 30 day notice provision

n) coverage for operations involving explosives, pile driving, support of any property (XCU) performed by sub-contractors. Where the Contractor performs such operations himself he shall obtain suitable coverage and shall provide the Department with a Confirmation of Coverage signed by an Authorized Representative of the Insurer signifying the validity of the Coverage. Such Confirmation shall be provided to the Department prior to the commencement of any XCU work and shall include all Schedule E requirements for Liability Insurance (Items a to o inclusive)

o) Liability Limits of not less than $2,000,000 or as currently carried by the Contractor whichever is greater

and such policy shall not be on a "Claims Made" Form.

All as detailed on the Department's
Confirmation of Coverage form

Part C - Automobile Liability

The Insurance policy required under this Part C shall include:

a) coverage for the liability for all vehicles owned, hired, or leased in the performance of the Project

b) Limits of Liability of not less than $2,000,000 or as currently carried by the Contractor whichever is greater

continued ...

Part D - Special Items

a) The Department reserves the right to require the Contractor to insure his property, plant and equipment, for such amounts as the Department deems adequate, and to require the Contractor to file with the Department evidence of such insurance in a format acceptable to the Department.

b) The Department further reserves the right to require the Contractor to carry such other insurances as are deemed appropriate by the Department having regard to the nature of the project undertaken.

c) The insurance requirements as set out in this Schedule E and supporting forms shall not in any way limit the Contractor's liability arising out of the project, contract or otherwise.

d) All insurances required to be provided and maintained by the Contractor shall be negotiated for, procured from, and the premium paid to a resident agent of an Insurance Company licensed to do business in the Province of New Brunswick.

e) The requirement of the Contractor to provide Confirmations of Coverage to the Department shall survive the completion of the project. The Department reserves the right to ask for and the Contractor specifically agrees to provide evidence of insurance covering the period subsequent to the term of the project contract for such eventualities as warranty periods, maintenance periods, the completion of deficiency lists, etc.

CONTRACT NO.______________

CONFIRMATION OF COVERAGE

The Insurance coverages procured and maintained by the Contractor for this contract are understood and agreed to include the following:

COURSE OF CONSTRUCTION (BUILDERS RISK)

- Broad Form coverage (IBC 4042 or better) including Flood and Earthquake in an amount equal to 100% of the value of the structure(s) (Schedule E items a and b)
- Replacement Cost basis (Item c)
- Policy written in the name of Her Majesty the Queen in Right of Province of New Brunswick, Represented by the Minister of Transportation ("Owner"), the Contractor and the sub-contractors as their interests may appear (Item e)
- Insurer's Waiver of Subrogation against Her Majesty the Queen et al (Item f)
- Deletion of "By-laws" exclusion (Item g)
- Thirty days prior written notice to the Department of Transportation of any change to, cancellation or lapse of the Insurance coverage (Item h)
- Coverage for resultant damage of faulty or improper material, workmanship and/or design (Item i)

Name of Insurance Company: ______________________________

Policy Number: ______________________________

____

Date

____

Signature of Authorized Representative
of Insurance Company

Revised January 01, 2005

CONTRACT NO.______________

CONFIRMATION OF COVERAGE

The Insurance coverages procured and maintained by the Contractor for this contract are understood and agreed to include the following:

COMMERCIAL GENERAL LIABILITY

- "Occurrence" definition of "accident" (Schedule E, Item a)
- Her Majesty the Queen in Right of the Province of New Brunswick Represented by the Minister of Transportation included as Additional Insured

  The addition of the Province as Additional Insured shall not prevent recovery in any situation in which recovery would have been available had the Province not been so named (Item b)
- Owners and Contractors Protective Liability (Item c)
- Cross Liability Clause respecting All Insureds (Item d)
- Insurer's Waiver of Subrogation against Her Majesty the Queen et al (Item e)
- Blanket Contractual Liability (Item f)
- Products/Completed Operations Liability (Item g)
- Broad Form Property Damage (Item h)
- Non-owned Automobile Liability (Item i)
- Contingent Employers Liability (Item j)
- Personal Injury (Item k)
- Coverage extended to include machinery attached to automobiles (Item l)
- Thirty days prior written notice to the Department of Transportation of any change to, cancellation or lapse of the Insurance coverage (Item m)
- Coverage for

  a) Property Damage arising out of operations involving explosives, pile driving, or removal or weakening of support of any property, (XCU) where the work is performed by sub-contractors and

  b) for Property Damage arising out of the same perils (XCU) included within the Products or Completed Operations coverage whether performed by the Contractor or sub-contractors. (Item n)

- Limit of Liability of not less than $2,000,000 or as currently carried by the contractor whichever is greater (Item o)
- Occurrence Policy Form (not Claims Made)

Name of Insurance Company: ______________________________

Policy Number: ______________________________

____________________	____________________
Date	Signature of Authorized Representative of Insurance Company

Revised January 01, 2005

CONTRACT NO._______________

CONFIRMATION OF COVERAGE

The Insurance coverages procured and maintained by the Contractor for this contract are understood and agreed to include the following:

AUTOMOBILE LIABILITY

- Covering all motor vehicles owned, hired or leased in the performance of the Project

- Limit of Liability of not less than $2,000,000 or as currently carried by the contractor whichever is greater

Name of Insurance Company: ____

Policy Number: ____

____
Date

____
Signature of Authorized Representative
of Insurance Company

Revised January 01, 2005

CONTRACT NO.______________

CONFIRMATION OF COVERAGE

The Insurance coverages procured and maintained by the Contractor for this contract are understood and agreed to include the following:

GENERAL LIABILITY FOR BLASTING OPERATIONS

- "Occurrence" definition of "accident" (Schedule E, Item a)

- Her Majesty the Queen in Right of the Province of New Brunswick Represented by the Minister of Transportation included as Additional Insured

  The addition of the Province as Additional Insured shall not prevent recovery in any situation in which recovery would have been available had the Province not been so named (Item b)

- Owners and Contractors Protective Liability (Item c)

- Cross Liability Clause respecting All Insureds (Item d)

- Insurer's Waiver of Subrogation against Her Majesty the Queen et al (Item e)

- Blanket Contractual Liability (Item f)

- Products/Completed Operations Liability (Item g)

- Broad Form Property Damage (Item h)

- Non-owned Automobile Liability (Item i)

- Contingent Employers Liability (Item j)

- Coverage extended to include machinery attached to automobiles (Item l)

- Thirty days prior written notice to the Department of Transportation of any change to, cancellation or lapse of the Insurance coverage (Item m)

- Limit of Liability of not less than $2,000,000 or as currently carried by the contractor whichever is greater (Item o)

- Occurrence Policy Form (not Claims Made)

Name of Insurance Company: ____

Policy Number: ____

____________________ ____

Date Signature of Authorized Representative
of Insurance Company

Revised January 01, 2005

New Nouveau Brunswick

PROVINCE OF NEW BRUNSWICK

DEPARTMENT OF TRANSPORTATION

FORM OF TENDER

FOR

CONTRACT No.

ITEM No. ARTICLE No.	ITEM UNIT PRICE, LUMP SUM PRICE (FIXED PRICE), AS THE CASE MAY BE, SHALL BE EITHER TYPEWRITTEN, PRINTED OR WRITTEN IN INK IN WORDS IN THE SPACE PROVIDED FOR EACH ITEM IN THIS COLUMN ARTICLE Le prix unitaire, le prix forfaitaire (prix fixé), selon le cas, dois être inscrit ci-dessous en toutes lettres, soit à la machine à écrire, soit imprime à l'encre dans l'espace réservé à chaque article.	MEASURE MESURE	APPROXIMATE QUANTITIES QUANTITIES APPROXIMATIVES	UNIT PRICE (IN FIGS) PRIX UNITAIRE (EN CHIFFRES)	TOTAL TOTAL	
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Carried Forward

Brought Forward ... Page #

ITEM No. ARTICLE No.	ITEM UNIT PRICE, LUMP SUM PRICE (FIXED PRICE), AS THE CASE MAY BE, SHALL BE EITHER TYPEWRITTEN, PRINTED OR WRITTEN IN INK IN WORDS IN THE SPACE PROVIDED FOR EACH ITEM IN THIS COLUMN ARTICLE Le prix unitaire, le prix forfaitaire (prix fixé), selon le cas, dois être inscrit ci-dessous en toutes lettres, soit à la machine à écrire, soit imprime à l'encre dans l'espace réservé à chaque article.	MEASURE MESURE	APPROXIMATE QUANTITIES QUANTITIES APPROXIMATIVES	UNIT PRICE (IN FIGS) PRIX UNITAIRE (EN CHIFFRES)	TOTAL TOTAL	
	....Dollars and ....cents				$	¢
	....Dollars and ....cents					
	....Dollars and ....cents					
	....Dollars and ....cents					
	....Dollars and ....cents					
	....Dollars and ....cents					
	....Dollars and ....cents					
	....Dollars and ....cents					
	....Dollars and ....cents					

Total Bid

HST Total .... Dollars and........................ cents	$	¢

We/I,..

do hereby offer to furnish all and every kind of labour, tools, machinery, implements, and other plant, services, and materials, whatsoever necessary to perform the undermentioned Work within the limits of the time specified; namely:

PROVINCE OF NEW BRUNSWICK
DEPARTMENT OF TRANSPORTATION
CONTRACT NO. ....

Name of Project

In accordance with the Contract Documents, specifications, plans, profiles, and drawings, prepared, or to be prepared, for the purpose of such Work and upon the terms and conditions set out in the printed form of Contract to be furnished, and in every respect to the satisfaction of the Chief Engineer, all the Work of the different kinds hereinafter mentioned in the said specifications so far as the same are applicable to the class of Work hereby tendered for and required in the construction of the Work tendered.

At and for the prices set opposite the different Items.

Accompanying this tender is one of the following:

1) A Bid Security Deposit in the form of a Certified Cheque payable to the Minister of Finance in the amount of ....

OR

2) A Bid Bond with HER MAJESTY THE QUEEN in right of the Province of New Brunswick as represented by the Minister of Transportation as obligee in the amount of ....

.... in

accordance with the terms of the advertisement calling for this tender. We/I do hereby declare and agree that in the case of our/my refusal to execute a formal Contract with the Department within 14 days after the notification of acceptance of this tender, the said bid bond shall be forfeited in accordance with Section 24 of Regulation 82-109 under the Crown Construction Contracts Act to the Department as liquidated damages for the said refusal.

We/I, the undersigned have examined the Contract Documents, plans, specifications (including all revisions thereto), and the location of the above described Work and are fully informed as to the nature of the Work and the condition relating to its performance, and understand the quantities shown in the estimate are approximate only and are subject to either increase or decrease, and hereby agree to conform to all respects to the terms and conditions of this tender, and to sign a formal Contract therefore upon demand.

Dated at .... this ...... day of ....20...

Contractor ....

Signature of Authorized Representative ....

Address ....

....

TO: THE MINISTER OF TRANSPORTATION
DEPARTMENT OF TRANSPORTATION
PROVINCE OF NEW BRUNSWICK
FREDERICTON, NEW BRUNSWICK

G

This document is the document referred to as "Plans and Standard Specifications" and marked "G" in the Articles of Agreement entered into on the ____________________ day of _______________ 20____, between the Owner and the Contractor.

(
(
(
(
(______________________________
(OWNER

signed

(
(
(
(
(______________________________
(CONTRACTOR

PROVINCE OF NEW BRUNSWICK

DEPARTMENT OF TRANSPORTATION

STANDARD SPECIFICATIONS

PROJECT:

I

This document is the document referred to as "Affidavit" and marked "I" in the Articles of Agreement entered into on the .... day of .... 20........ between the Owner and the Contractor.

Signed { ______________________
Owner

{ ______________________
Contractor

I, ... of the ....
in the County of .... and the Province of ....
make oath and say:

1. That I am secretary-Treasurer of ....
...., a body corporate under and by virtue of the laws of the Province of .... having its Head Office at ....
....in the County of ....
and the Province of .... and I have custody of the Corporate Seal of the said Company.

2. That the Corporate Seal affixed to the aforegoing Indenture is the Corporate Seal of the said .... and was affixed thereto by me by authority of the Board of Directors thereof.

.3 That the signature "..." set and subscribed to the said Indenture as President of .... is in true and proper handwriting of .... who is the President of the said Company and the signature "..." set and subscribed thereto as Secretary-Treasurer of the said Company is in true and proper handwriting of me, this deponent.

SWORN to me at the City of
.... in the
County of ....
and the Province of ....
this .... day of .... 20..... .

....
Secretary-Treasurer

....
Commissioner of Oaths

40-1280

BGG EBW U

b f

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